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ABSTRACT

This collection of teaching units developed in Australia arises from "Special Forever: An Environmental Communications Project," which enables students to develop critical awareness of their local environments and communicate this awareness effectively. The project also aims to encourage school-based action in support of the environment and facilitate the publication of students' work as they study and respond to environmental issues. The collection's units are programs of learning tied to purposeful activity and have already undergone successful trials in elementary classrooms in Australia. The collection is divided into the following sections: Introduction; Themes; Learning Sequence; Living Together (Unit 1: Kids Care; Unit 2: Wiggly Worms; Unit 3: Food for Thought; Unit 4: Friends for Life; Unit 5: Gone Feral; Unit 6: Who Eats What?; Unit 7: Whose Problems?; Unit 8: Liquid Gold; Unit 9: Trees for Life; Unit 10: Treading Lightly); Managing Resources (Unit 11: Making Sense; Unit 12: Going Green; Unit 13: Down the Gurgler; Unit 14: Resources, Not Rubbish; Unit 15: Saline Solutions; Unit 16: Eyes in the Sky; Unit 17: Where Does Your Water Come From?; Unit 18: Splash!; Unit 19: What's Bugging Your Water?; Unit 20: Wonderful Water!); and Time and Change (Unit 21: Message to the Future; Unit 22: About Town; Unit 23: Inventive Aussies; Unit 24: Down by the River; Unit 25: Cruisin' Down the River; Unit 26: Changing Landscapes; Unit 27: Know Your Neighbors; Unit 28: Heritage Trail; Unit 29: Biodiversity; Unit 30: Agenda 21). (NKA)

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CHANGING LANDSCAPES

Integrated teaching units

PETA

CS 511 982

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Integrated teaching units

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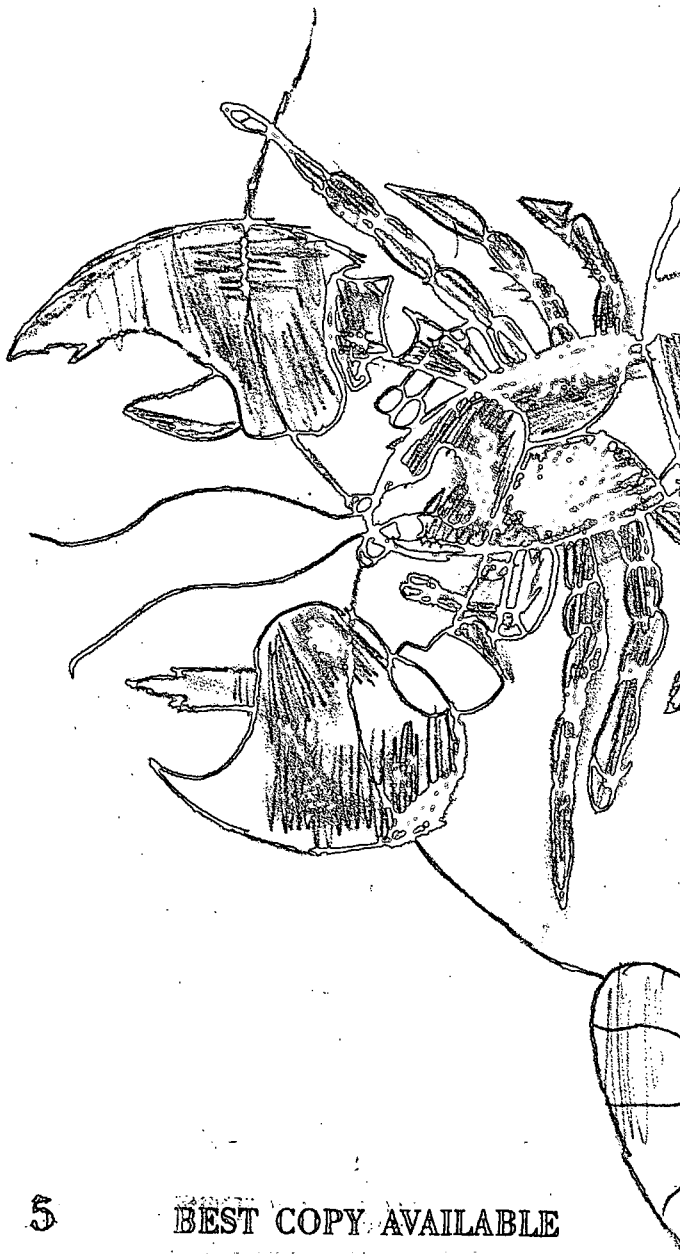

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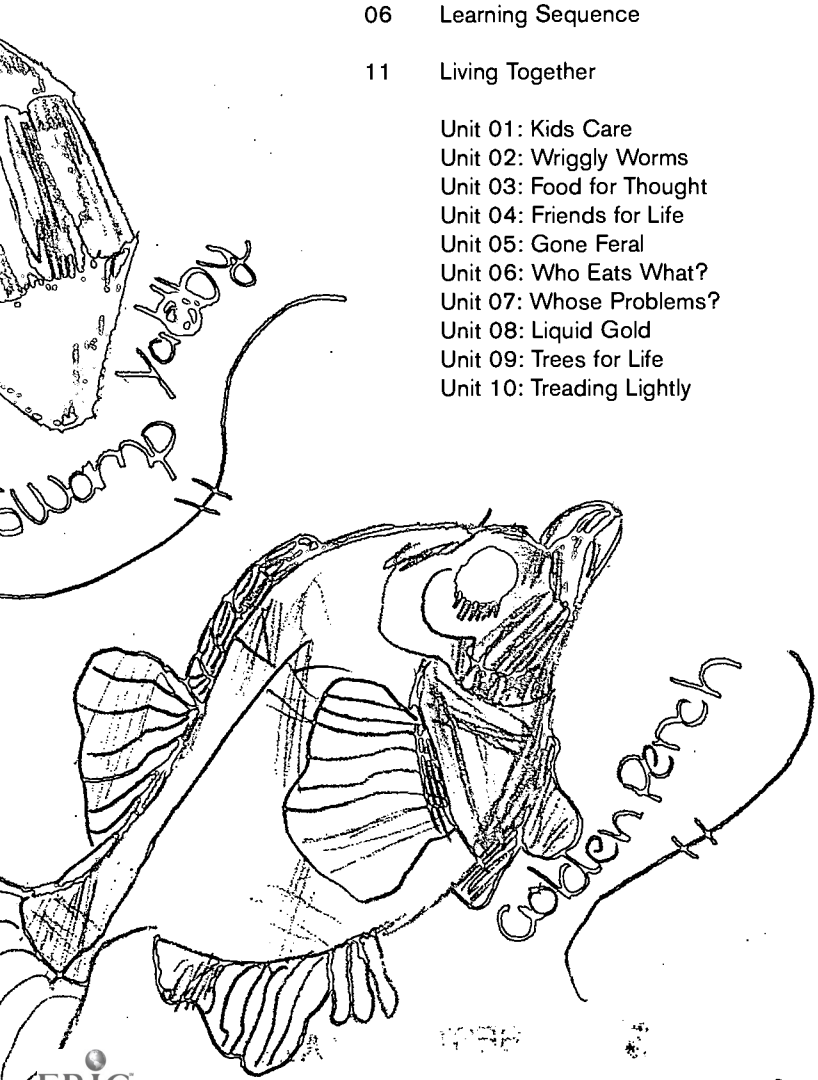

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ACKNOWLEDGEMENTS

This collection of teaching units arises from *Special Forever: An environmental communications project.* This project enables students to develop critical awareness of their local environments, and to communicate this awareness effectively. It also encourages school-based action in support of the environment, and facilitates the publication of students' work as they study and respond to environmental issues. *Special Forever* represents primary schools within the Murray–Darling Basin, and is managed by the Primary English Teaching Association for the Murray–Darling Basin Commission. Sincere thanks go to project coordinator Andrew Connolly, whose vision and commitment have made this publication possible.

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INTRODUCTION

Michele Knobel &
Colin Lankshear

The context

The teaching units presented in this book are richly conceived programs of learning tied to purposeful activity. They engage with *real* environmental issues that are of direct concern to all Australians. Among others, these issues include groundwater salinity, manufactured waste, individual and community ecological impact, and town planning. These units have been developed by teachers and have been trialled successfully in primary-school classrooms. This means the teaching and learning suggestions in the following pages are not idealised constructions; rather, they are designed with everyday teaching contexts in mind.

Approaches to teaching and learning that promote classroom engagement with mature social practices underpin the units in this book. These approaches move the learning process well beyond conventional master–apprentice or teacher–student models of learning to encourage teachers to construct their classrooms as communities of learning and practice. In doing so, they resonate with Barbara Rogoff's (1995) conception of 'cultural apprenticeship', which serves as a useful guide to understanding how effective learning most often takes place in everyday social contexts.

Cultural apprenticeship and meaningful learning

Rogoff proposes three dimensions that explain how authentic learning takes place within social groups and institutions:

- Apprenticeship
- Guided participation
- Participatory appropriation.

Apprenticeship, according to Rogoff, occurs within a community of experts and learners who are participating in an activity in socially organised and recognised ways (for example, selling biscuits to raise funds for a club). Apprenticeship requires collaboration among learners *and* experts. The learners provide resources and challenges for each other in the course of mastering an activity; the experts support learning while further refining their own understanding. In this way, learners and experts variously take on the role of teacher and learner on a moment-by-moment basis. The units in this book engage students in collaborating with each other and with experts in exploring environmental issues. For example, one unit outlines how teachers and students can work with local town councils as part of the Agenda 21 environment and development program directed by the United Nations. Within this unit, students work collaboratively with local town planners to design and construct a model of a town that responds directly to environmental care imperatives identified by organisations like the Gould League and the World Wildlife Fund.

Guided participation refers to the various ways in which learning can be co-ordinated and supported within and beyond a group. It encompasses a range of social interactions, including face-to-face, side-by-side, and other arrangements that do not even require learners and experts to share the same physical location. Guided participation occurs throughout these units as students engage in a range of data-gathering activities such as documenting their family's water or petrol use. These activities involve different community members as co-learners and experts in a range of interactions, including student-led interviews, side-by-side interactions between the teacher and collaborative groups, email communications with peers and experts, and so on.

Participatory appropriation describes that dimension of learning where learners become increasingly independent, if not expert, participants in the activity being mastered. For Rogoff, this dimension is signalled by a transformation in understanding and responsibility. The units within this book provide ample opportunities for students to become self-activating carers for their environment. As an example, one unit encourages students to become involved in Saltwatch, a community-operated soil and groundwater salinity monitoring program. Saltwatch Week involves hundreds of schools and communities around Australia collecting local water samples and analysing their salt content. Students learn how salinity becomes a local and global issue, how to care properly for existing fresh-water reserves, and what they themselves can do to slow or even reverse fresh-water salinity levels in their local area. In doing so, they are encouraged to

communicate with experts and other learners via email and dedicated websites. Results from the sample analyses are compiled in order to produce an annual salinity profile that is used to help shape government and other environmental groups' responses to this issue. In addition, students independently produce a report for their community on local groundwater salinity.

Putting any one of the teaching units in this collection into practice will 'culturally apprentice' students to the processes involved in making informed, environmentally responsible and community-based decisions, both now and in their post-school lives.

Multiple perspectives

A particular strength of the units in this book is that they do not pretend there are neat, easy answers to real-world problems. If anything, the data-gathering tasks within different units will serve to underscore just how complex environmental issues are, and how they impact differently on a range of people. For example, teachers are encouraged to problematise global warming by presenting a range of scientific positions on the greenhouse effect. At the same time, students are expected to think pragmatically about the likely effects of global warming on farming in South Australia, tourism in Tasmania, postal services in the Pacific Islands, a child living in East Timor, and so on, in order to better understand global warming as an issue that affects people in different ways.

Throughout these teaching units, students are challenged to move beyond a goodies-versus-baddies mindset that focuses on trying to apportion blame for environmental disasters. Instead, they are expected to identify the cumulative activities that generate environmental degradation and how this in turn requires commitment to ongoing project-based (rather than magic bullet) approaches towards environmental remediation.

Learning strategies rather than fixed content

The problem-based approach that underpins these teaching units emphasises strategies and processes associated with knowledge production, rather than on discrete items of content that are quickly forgotten (such as rainfall averages for an area, or salt concentrations in a range of naturally occurring liquids). In the information age, 'content' quickly becomes outdated as new information is shared rapidly around the world, displacing the old in the blink of an eye. These teaching units recognise the importance of equipping students with well-honed research skills that work just as well in print libraries as they do in virtual space archives and portals. These skills include, for example, equipping students with key words to use in catalogue and online searches, and teaching students to sift critically through useful information, misinformation (incorrect, outdated or incomplete information), disinformation (deliberately misleading information), and useless information.

Students are required to analyse, synthesise, critique and extrapolate data to their particular community context or to the issue under study. These kinds of higher-order thinking processes are sought-after abilities in school and elsewhere. The development of transferable thinking processes is encouraged by the cross-curriculum nature of the teaching units in this book. Indeed, one particularly attractive feature is that many of these units include subject areas not often associated with environmental studies, such as fine arts, drama and music. Students are also involved in producing a range of texts – such as 3D models, posters, quilts, dramatisations, interviews and thank-you letters – for a range of social purposes (e.g. presenting planning ideas, alerting the community to local environmental issues). This match between text types and purposes enables students to experience the connection between context and effective, socially valued text uses.

Active citizenship

Underpinning this collection is a deep concern with promoting active citizenship in classrooms and communities. By 'active citizenship' we mean civic participation in institutional life that promotes the common good and that calls into play the need to negotiate diversity, identities (or subjectivities) and loyalties as people go about learning to live productively and harmoniously with difference (Lankshear & Knobel, 1997). In this book, active citizenship is supported by experiences that teach students to live productively, responsibly and sustainably within a range of environments. It also takes seriously the need to provide spaces within the curriculum for students to explore what it means to be a committed and participatory citizen – one not necessarily bound by regional or national borders.

Future orientation

In closing, the teaching units in this volume are forward-looking in their aim to equip students for a world that is difficult to know in advance. Ulrich Beck (2000:137–138), in an extended discussion of globalisation and its implications for education, reminds us that school learning should

> loosen or do away with its links to a particular job or occupation ... This should not only be understood in terms of 'flexibility' or 'lifelong learning', but should also cover such things as social competence, the ability to work in a team, conflict resolution, understanding of other cultures, integrated thinking, and a capacity to handle uncertainties and paradoxes ...

The units of work described in the following pages clearly attend to the importance of promoting an informed, socially responsible and adept citizenry that is able to work collaboratively towards shared goals that focus on improving and caring for our planet. Indeed, this book sounds a clear call for educators to invest in our collective future by equipping students with sound strategies for obtaining and processing information in order to produce useful social and environmental knowledge and ongoing transformative action.

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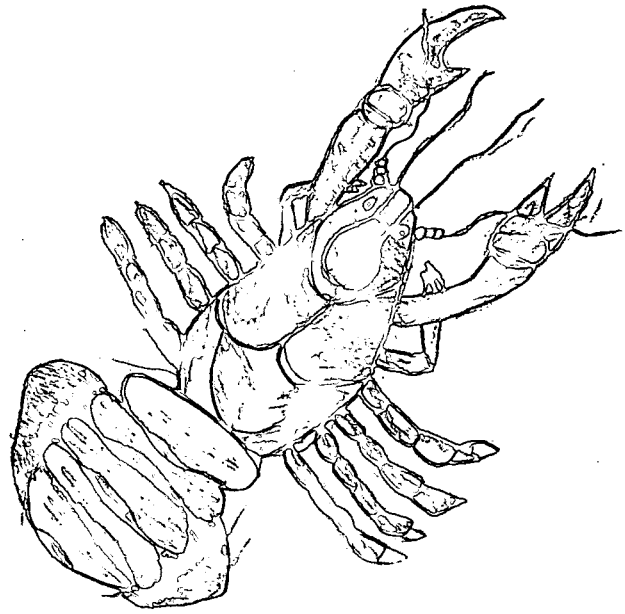
Michele Knobel is a freelance education researcher and writer who lives in Mexico. She is currently a Visiting Lecturer at the University of California, Irvine.

Colin Lankshear is a Professorial Research Fellow at the University of Ballarat, and a freelance education researcher and writer based in Mexico.



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THEMES

The integrated units of work and the teaching suggestions contained within these units are based around the themes Living Together, Managing Resources, and Time and Change.

Living Together

Students are part of a community of living things that interact with one another and with the natural and built environments. Students explore these interactions when they undertake units around this theme, uncovering interrelationships, causes and effects. In the process, they come to understand more deeply that, just as their actions have an impact on their environment and its inhabitants, so too do their surroundings shape their lives.

Managing Resources

The natural environment supplies the resources needed for a healthy world. Because these resources are finite and susceptible to damage, students must understand the importance of using them wisely, valuing the skills and experience of the people who live in their communities, and co-operating so that everyone gets a fair share. Units around this theme explore the sustainable use of resources, with a focus on water management. They look at current land and water management issues, and the ways in which individuals and communities are responding.

Time and Change

'Time' and 'change' are difficult concepts for children to understand, yet they are central to appreciating the environment. A further challenge is for young students to recognise that 'change' need not be something that they passively receive, but something that they can bring about intentionally. Units around this theme enable students to examine ways in which individuals and groups have modified their interactions with their environments in order to repair past damage and achieve sustainable development. They offer the perfect opportunity for students to learn about the past and the present, and to create a vision for the future.

LEARNING SEQUENCE

Within each theme, the spread of units integrates outcomes from a number of learning areas. Each integrated unit contains teaching suggestions organised into a four-stage learning sequence: engaging, inquiring, acting and communicating. The sequence ensures that students are provided with opportunities to develop interest in a topic, learn more about it, undertake some informed related action, and then communicate with an appropriate audience.

Engaging

In this phase, teachers support students to make connections to the unit topic that build on existing knowledge and experience. It is important in this stage to identify and validate students' needs and interests, especially in relation to their local community. This orienting phase must capture attention, establish relevance, pose a question or problem and set the context for the learning experiences to follow.

Planning effective engagement: Teacher questions

Which learning-area outcome/s will form the focus of student learning?

How will I find out what students know?

What experience, prior knowledge, ideas and interests do students have that I can build on?

What initial experiences will help engage students?

How will I introduce key ideas of the unit, and how will I connect these with the students' existing understandings and experiences?

What local environmental, societal and personal contexts and experiences will help students?

What literacy skills will students need for these learning activities?

How will I know what, and how well, students are learning?

What do I want to observe and record of each student's skills and knowledge?

Which learning-area outcomes will be most relevant for learning and assessment?

Sample teaching strategies

Brainstorm

Concept map

Knowledge retrieval charts

Displays

Question production

Role-play/Drama

'What if' questions

Inquiring

At this phase, the teacher works with students to negotiate the individual and group focus of learning. This will be determined by what is currently known about a topic and what is necessary to know. The teacher might also identify and communicate the nature of the task, including the learning goals, and make clear what students will do to demonstrate that they have performed successfully. As students undertake individual and group investigations or research, the teacher may direct students to appropriate resources, clarify new terms or concepts, and guide students to reflect continuously on their goals, their individual roles and their co-operative processes. The aim of this phase is to extend and deepen students' knowledge and understandings of the topic so that they have a basis for action and communication.

Planning effective inquiry: Teacher questions

How will I help students to identify what they know about and what they want to find out more about?

What questions do students have?

How will I support students to build content knowledge?

How will I assist students to clarify their questions?

How will I support student learning actions?

How will I support students to consolidate learning?

What resources (posters, videos, books, websites, CDs, audio/audio-visual tapes etc.) will complement this unit of work?

What other resources/experts will complement this unit?

What literacy skills will students need to maximise learning?

Having identified what students need and want to find out about, which learning area and learning outcomes are most relevant?

Sample teaching strategies

Define, locate, select, organise, present, evaluate

Expert grouping

Explanation

Question-devising

Questionnaires

Quiz questions

Retelling

Think, pair, share

Acting

Action is included as a specific phase within the unit design to encourage students' participation in local environmental action. In this phase students, having developed knowledge of a particular aspect of their local environment, undertake informed actions beyond the classroom. At this phase, teachers may need to support skill-based activities through instruction and demonstration; they may also need to co-ordinate with community experts, venues etc. to facilitate student action.

Planning effective action: Teacher questions

What opportunities for action will I include in relation to this unit?

How will I facilitate these actions?

What local organisation/s can help us?

What literacy skills will students need to act effectively?

Which learning outcomes will be most relevant for student learning and assessment?

Sample teaching strategies

Community survey

Environmental display

Establishment of dedicated area (e.g. nature reserve, aquarium)

Flora and fauna survey

Interviews

Monitoring (e.g. of domestic water consumption, waste disposal)

Population survey (e.g. of flora, fauna, insects)

Recycling

Regeneration

Site visit (e.g. to farm, dam, water-treatment plant, river)

Testing and analysis (e.g. of water, soil)

Communicating

Students come to this phase with knowledge and experience about a particular aspect of their local environment. Communication provides a significant opportunity to synthesise new understandings and develop multiliteracy. Teachers plan to teach students the requisite literacy skills and provide adequate support to ensure that they can communicate effectively in a range of media. Students should have the opportunity to select the most appropriate genres to communicate their ideas, understandings and messages.

Planning effective communication: Teacher questions

Do the students have content that is sufficient and accurate for the purposes of communication?

What literacy skills will students need to communicate effectively?

What literacy activities will enable students to communicate their understandings and actions to our: class? school? town? region?

Who is the students' audience? What is their purpose in relation to that audience?

What communication modes and media might best support students' purposes?

What genres might support students' purposes? What are their structural, language, audio and visual features?

In what different contexts could you present students' texts? (For example, a jointly constructed narrative could be adapted for a school performance, then performed as a part of Education Week for a senior citizens' association.)

How will you support students to take their communications from design/drafting to publication stage?

Which learning outcomes from English, (Creative) Arts and Technology curriculum documents will form the basis of student learning and assessment?

Sample teaching strategies

Genre deconstruction and (re)construction, e.g. description, event report, scientific report, procedure, advertising poster, letter to editor, poetry, exposition, explanation

Expert support in using communications technologies, e.g. painting, drawing, printing/reproduction processes, digital photography, film, multimedia, computer-aided design/drafting, sound recording etc.

Audience surveys

Marketing/Communications plan

Team meetings to review progress against plans/deadlines

Role-setting, e.g. project manager, copywriter, editor, designer, producer, marketing manager

Rehearsal and audience trialling

Peer evaluation/revision

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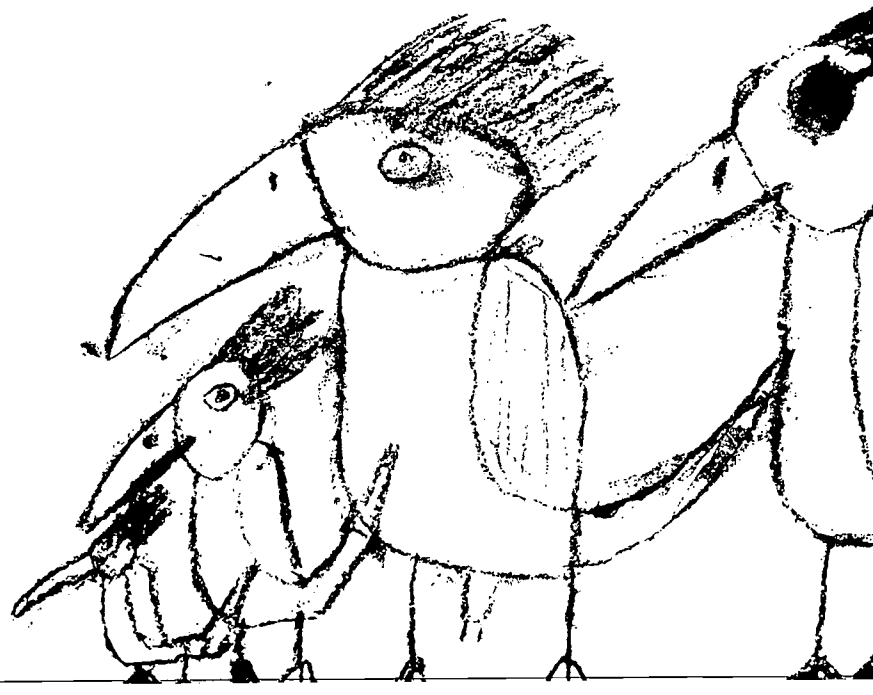
LIVING TOGETHER



LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 1 & 2

UNIT DESCRIPTION

Students investigate human impact on the built and natural environments, using the familiar problem of litter as a case study in environmental management. Students start with a sensory exploration of their school environment, then broaden their investigations to include the local community. In the process, they are informed by local experts who provide examples of environmental change. Students use their understandings to propose and enact school litter-management strategies.

WORD BANK

biodegradable, landfill, litter, senses, vegetation

RESOURCES

Print

Baker, J (1987) *Where the Forest Meets the Sea.* Julia MacRae Books, Sydney.

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Videos

Baker, J (1987) *Where the Forest Meets the Sea.* 9 mins. Film Australia, Sydney.

Websites

http://directory.google.com/Top/Science/Environment/Education/
Google compendium of educational sites relating to the environment.

www.yahooligans.com/Science_and_Nature/The_Earth/Environment/
Yahoo! environmental compendium for children.

http://geography4kids.com
Student-friendly explanations of scientific and geographic terms (USA).

www.cleanup.com.au
Clean Up Australia.

Engaging

Using your senses

Lead the students on a walk around the school grounds. Explain that students must use all their senses to interact with the environment. During the walk, stop students at appropriate locations and ask them what they can see, hear, touch etc. Ask students to list or draw the things that they sensed.

Return to the classroom and compile a class list of all the things recorded. Use a map of the school grounds to locate the things listed.

Allow students to revisit locations visited on the walk to make more detailed drawings of particular areas. As a class, discuss each location drawn, noting how each place might have been changed in the construction of the playground (i.e. the addition of buildings, play equipment, fences, retaining walls, flower beds, pathways).

The changing environment

Brainstorm ways in which people have intervened to change the local environment beyond the school (e.g. road construction, land-clearing to farm and build houses, building construction, damming, landscaping, mining, manufacturing).

Discuss: Why have these changes been made? How has the environment changed as a result?

Inquiring

Arrange for a guest speaker from a government or community group – such as the state or national park authority, the local Aboriginal Land Council, or the local council, museum or environment centre – to visit the classroom and talk to students about particular changes in the local area, and the impacts of these changes on the community and the local environment. Ask the speaker to bring in photographs, newspaper clippings or other artefacts to support their talk.

Read *Lester & Clyde* to the class (see print resources). Discuss the story in terms of environmental change precipitated by human interaction. Make connections from the story to the changes that students have discovered in their local environment. Discuss incidents of environmental change suggested by students and ask them to consider how these changes have impacted on plants, animals and other people. Ask students to try and think of examples of human intervention that have had little or no impact on plants, animals or other people.

Help students to undertake a litter survey in the school playground. The survey should aim to find out the:

- type of litter
- location of the litter
- origin of the litter
- method of disposal.

Record, graph and discuss the students' results. Extend the discussion by asking: What happens if litter is not picked up and put in the bin? Does it eventually break down in the environment (is it biodegradable)? Does it go into landfill? Does all the litter in the playground come from inside the school? Does the litter leave the playground (e.g. washed down storm-water drains, blown away by the wind, carried away by animals and birds)? Ask them to identify the ways in which their actions affect the school environment. List suggestions for improving the school litter situation.

Acting

Support students to implement the school litter-management strategies they have identified.

Promote student participation in large-scale litter-management programs such as Clean Up Australia.

Read *Where the Forest Meets the Sea* (or view the video) and *Window* to the students. Both provide an excellent visual representation of environmental change over time as a result of human intervention. Lead discussion of each by asking: What story do the illustrations tell? What do you think the author's purpose was? Ask students to consider what is being said about people living together with the natural environment.

Communicating

What if?

Form the students into small drama groups. Ask each group to focus on one way in which humans have acted to change the local environment (drawing on their brainstorm in the engaging phase). Each group must set and answer a question beginning with 'What if?' through a co-operative dramatic presentation. For example: 'What if we cut down too many trees?' 'What if fertilisers continue to leach into the river?' Allow students time to develop and discuss their question, and to organise and practise their presentation, before performing to the class.

Representing

Using the collage technique from *Where the Forest Meets the Sea*, help students to construct a model or picture that shows how a particular local area has been changed by people.

Organise student groups to paint or draw posters that promote the school litter-management strategy developed by the class. Make sure that the posters focus on communicating the impact of the school litter problem on the wider community.

Litter campaign

Construct a joint explanation outlining how the class has tackled the litter situation within the school. Discuss and model the sequencing of ideas beforehand, for example: recording the situation; identifying the problem; analysing the problem; proposing solutions; implementing a plan of action.

Organise a school assembly to raise awareness of local issues of environmental change and the likely impacts on the wider community.

Construct a joint exposition on why litter management and recycling are important.

UNIT 02: WRIGGLY WORMS

LEARNING AREAS	Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 1 & 2
UNIT DESCRIPTION	Students investigate the nature and structure of earthworms, and their benefits to the environment. They then use earthworms as a means of testing soil health, before constructing an earthworm farm. After representing their soil analysis in the form of a labelled map and table, students use oral and written modes to recount the steps taken to construct the farm.
WORD BANK	aerate, casts, invertebrate, saddle, segments, vermiculture, wormery
RESOURCES	Print Burnie, D (1991) *How Nature Works.* Dorling Kindersley, London. Hann, J (1991) *How Science Works.* Dorling Kindersley, London. Trafford, C (2001) *A Worm's Eye View ... The History of the World.* Etram, Rozelle. Websites www.mdbc.gov.au Murray–Darling Basin Commission. For selected invertebrates, go to Education and choose Plants and Animals from the encyclopedia. www.wilburworm.com Worm facts, activities and environmental art by children. www.steveparish.com.au Steve Parish Publishing. www.gould.edu.au The Gould League. Includes classroom activities, resources and project support. www.urbanext.uiuc.edu/worms/ Student-friendly US site about worms.

Engaging

Bring a handful of worms into class and gather the students around. Invite the students to hold the worms gently on dampened palms and then to describe their feelings to the rest of the class. Ask the students to name the animal. Explain that earthworms do not have hard skeletons and are called invertebrates. Invite the students to name other invertebrates, and list them on the board. Provide resources so that students can list and illustrate invertebrates individually.

Draw a large diagram of an earthworm on the board. Write the following labels on pieces of card: *head*, *body*, *saddle*, *tail*, *segments*, *mouth*, *anus*. Show the labels to the class. Ask the students to suggest what job each part of the earthworm's body does, and how it helps the earthworm to live. Then use the diagram and cards to play 'Pin the label on the worm'.

Ask the students to describe where earthworms live, and to suggest what earthworms eat. Together, construct a sequenced explanation of earthworms' eating habits. Use labelled diagrams to illustrate the sequence, and display the finished product in the classroom.

Brainstorm the benefits of earthworms in an environment. (Earthworms mix and aerate soil by tunnelling through it, and add compost by eating organic matter and depositing it as casts, thereby improving drainage and creating a friable soil. Earthworms are also a valuable source of food for other animals such as birds and small mammals.) With the aid of the students, draw and display a simple web diagram showing the input of worms to an ecosystem. Ask the students to predict what impacts there would be on an ecosystem if earthworms were not present.

Inquiring

Help the students to find out some fascinating facts about worms by locating information in the school library or on the Internet. Make up a quiz using the information collected by each student.

Invite a vermiculture expert, knowledgeable farmer or fisher to visit the class and talk about earthworms and their benefits.

Arrange a visit to a local worm farm and show the students how earthworms are farmed commercially. Ensure that the students have lots of questions for the owner.

Acting

Earthworm survey: How healthy is the soil?

Give groups of students a shovel and direct them to dig up a shovelful of soil (approximately 20 cm square by 10 cm deep) in a dark, moist spot in the school playground. Help the students to break up the soil gently, set aside the earthworms and then count them and record their number.

Ask students to consider the health of the soil they uncovered. Tell them that generally, 0–5 earthworms per shovelful suggests a poor soil, 6–10 earthworms per shovelful indicates a reasonably good soil, while more than 10 earthworms means that the soil is really healthy.

Making a simple wormery

Ask each student to bring a clean jam jar, labelled with his or her name, to class. Then get the students to add 3 cm thick, alternating layers of damp river sand and soil to their jar. Add two or three earthworms to each and top with some decaying organic matter such as leaves or

grass clippings. Next, show the students how to make a cardboard cylinder to fit around their wormeries. Store all wormeries in a warm, dry place. Encourage the students to check their wormeries regularly and to add a drop or two of water if they are too dry. Ask them to monitor and record how quickly the different layers in their wormeries become mixed.

Building a worm farm using recycled scraps

Gather the following materials.

- A large waterproof container such as an old polystyrene box
- An old tray big enough to go under the box
- Bedding material for the worms to live in, such as cow or horse manure, grass clippings, peat moss or shredded paper
- Food scraps for the worms to eat, such as apple cores or bits of left-over meat (not onion or citrus)
- Earthworms – you can buy 'Red' and 'Tiger' composting worms from fishing shops or vermiculturalists
- An old hessian sack or piece of carpet, cut to the shape of the box.

Support the students to follow these directions.

- Put drainage holes in the bottom of the polystyrene box and stand it on an old tray.
- Half-fill the box with moist bedding material.
- Add the earthworms.
- Add some food scraps.
- Cover with a hessian sack or old piece of carpet.
- Keep the box in a warm, dark place.
- Dampen down regularly; the earthworms should thrive.

Communicating

Guide the students to co-construct an information report about earthworms. Then ask each student to write an information report about a variety of composting earthworm. Ask the students to illustrate the reports. Display them around the classroom.

Model the construction of a labelled map and results table using information derived from the students' earthworm survey.

Ask individual students to recount, for a partner, the sequence of steps they followed in building the simple wormery. Then organise the class into small groups and ask each group to construct a procedure setting out the way to build a worm farm.

Ask the students to write an illustrated recount of their visit to a worm farm. Suggest that they include a section headed 'Facts I learned about worms today'.

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 1 & 2

UNIT DESCRIPTION

Students explore the origins, cultivation and uses of different foods. They classify foods into groups, and begin to recognise that food preparation is a social practice that differs among groups of people. By growing their own wheat, students appreciate the importance of food, water and sunlight in food cultivation, the significance of careful management, and the connection between agriculture and consumption.

WORD BANK

ergot, farmer, gardener, oilseeds, recipes, wheat

RESOURCES

Videos

Australian Broadcasting Corporation (2001) *Secret Recipes*. Series. ABC TV.

Websites

www.abc.net.au/secretrecipes/
Recipes from the ABC TV series *Secret Recipes*.

www.lifestyle.ninemsn.com.au/aww/Kids/
Children's foods and recipes from *Women's Weekly* magazine.

www.tamaraskitchen.com.au/recipes/rec_group.asp?Kids
Children's recipes from Tamara's Kitchen.

www.coara.or.jp/~mieko/rice.htm
Information about growing rice in Japan.

Engaging

Display cereals, oilseeds, fruit and vegetables in the classroom. Place a number next to each food item, then ask the students to look carefully at each one and to write its name next to the appropriate number in their exercise books. Together, play an identification game called 'Name that food', and note the students' answers on the board. (Note: Observe school and system guidelines when introducing foodstuffs into the classroom)

Discuss each item. Brainstorm the foodstuffs and dishes that the items are processed and/or made into. For example, wheat is milled to make flour, which in turn can be used to make bread, cakes, biscuits or pasta. Represent the students' suggestions on the board as flow charts.

Write the name of each food item on a large sheet of card. Ask the students to cut out magazine pictures showing the different food products made from the item. Paste them onto the sheets of card. Display the completed posters around the room.

Inquiring

Display a large map of your state or region. Allocate groups of students a particular food group to research (e.g. cereals, oilseeds, vegetables or fruits). Help them locate web-based information about where each type of food group is grown. Shade in the growing regions on the map and add a key.

Invite a local farmer and/or keen gardener to talk to the class about growing a particular type of food group. Help the students to formulate questions for the speaker about the processes involved in growing and using that product.

Collate a list of the students' favourite foods on the board. Discuss the cultural origins of the different foods. For example, explain that pasta first became popular in Italy. Due to the migration of Italian people throughout the world, pasta dishes are now eaten by people from many other cultures. Ask the students to find out about foods that represent their own cultural heritage and invite them to bring some in to share with their classmates.

Acting

Growing wheat

Encourage the students to grow their own wheat in a sunny part of the classroom or schoolyard. It should take approximately three months for the wheat to ripen. Locate the following materials.

- Wheat seeds
- Plant pots or containers
- Potting compost or soil
- Water.

Support the students to follow these directions.

- Soak the seeds in water for a day prior to planting. This will hasten germination.
- Fill the plant pots or containers with potting compost or soil.
- Firm down the soil.
- Scatter a small handful of seeds over the top of the compost or soil.
- Cover with more compost or soil to a depth of 0.5 cm. (If the seeds are buried too deeply, they will not grow.)
- Water well.
- Place in a sunny position.
- Harvest the wheat when the seed heads have expanded and turned golden brown.
- Save the wheat seeds in an envelope for next year's planting.

Note: Do not allow the students to eat the wheat they have grown in case of ergot poisoning. (Ergot is a fungal disease that affects wheat.)

Encourage the students to measure the height of the wheat each day or week, and to construct a bar graph showing its growth over time. Ask the students to consider the following questions while compiling their results.

What are the three things that plants need to grow?

What starts to grow first – roots or leaves? Why?

Which way do roots grow?

Which way do stems grow?

How many plants came up in each pot? (Make a class graph of the results.)

Why do some pots have more plants than others?

Would there be enough wheat from all the pots to make a loaf of bread?

Communicating

Assemble enough dried grains and pulses to help small groups of students create a tactile map of cereal-growing areas.

Model a simple procedural text using an individual's favourite recipe. If practicable, help the class to follow the recipe and make the dish. Discuss the stages of the procedure. Then, ask the students to describe to a partner the procedure involved in making their own favourite dish.

UNIT 04: FRIENDS FOR LIFE

LEARNING AREAS	Studies of Society and Environment (NSW: HSIE), English, The Arts (NSW: Creative and Practical Arts), Mathematics
UNIT LEVEL	Years 1 & 2
UNIT DESCRIPTION	Students explore the nature of personal friendship, extending their understanding to take in essential aspects of community living such as co-operation and interdependence. They uncover the diversity of experiences and skills present in their community, recognising the contributions of community volunteers. Through the reading of selected texts, they also consider the importance of individual responsibility and action. Students represent their understandings co-operatively by designing and making a friendship quilt from scraps of donated fabric.
WORD BANK	(Drawn from discussion at the engaging phase.)
RESOURCES	Print Baillie, A (1993) *Rebel!* Scholastic Australia, Lisarow. Barwick, J & J (2001) *People Power: Australia's Volunteers.* Reed, Melbourne. Burningham, J (1991) *Oi! Get Off Our Train.* Red Fox, London. Muth, J J (2002) *The Three Questions.* Scholastic, New York. Websites http://amol.org.au/nqr/ Register of Australian quilts – see 'pieced random' quilts on the Australian quilt tree for examples. www.urbanext.uiuc.edu/conflict/index.html 'Out on a Limb: A Guide to Getting Along' – a resource for children from University of Illinois.

Engaging

Open a discussion about friendship. Ask the students to think of qualities that people need to be a friend. Use these qualities as adjectives to describe a friend. Write these words on the board and suggest that students copy them into their word banks.

Ask: must friends speak the same language? Brainstorm other ways that people can communicate with one another. Divide the class into groups of three and ask them to undertake a simple construction activity together without talking, e.g. building a bridge between two tables using a single sheet of paper. Ask each group to report any difficulties they had, and how they solved them.

Explain to the class that they are going to make a friendship quilt. The quilt will be made from scraps of left-over fabric from other projects, or discarded clothes that cannot be re-used. Start collecting this fabric from the start of the project.

Select one or more of the suggested books (see print resources) and read them to the class. Invite the students to retell the story to a partner. Reread the story, stopping at intervals and inviting the students to reconstruct some sections.

Extension activities

The Three Questions

Organise students into small discussion groups to consider the following.

Why does Pushkin say that 'a pack' is necessary to help you decide what is important?

Do you agree with Sonya, Gogol or Pushkin's reply to "Who is the most important one?"?

Who do you ask for help when you have a problem?

Imagine you are Gogol the monkey. Tell the story through his eyes.

Oi! Get Off Our Train

Organise the class into groups of 7–10. Take them to a location where there is space to perform a play. Give each group pictures of five endangered animals. Ask them to devise a play, based on the book, that includes the animals they have been allocated. Ensure they create the sound of the train speeding through the night and loudly chant *Oi!*. Ask: what should the little boy do with the animals once he wakes up?

Rebel!

Record, replay and discuss suitable extracts from televised news reports. Set up groups of five students. Take them to a location where there is space to throw a rubber thong. Ask them to pretend that they are news reporters covering the story – interviewing people in the village and reporting to the cameras. They then interview the General and hear his view of the event. Ask each group to act the scene out, nominating someone to throw the thong. How did the student feel when they threw the thong? Discuss whether this was a brave or silly thing to do.

Inquiring

As a research project, ask the students to find as many translations for the word 'friend' as they can. Suggest that they contact people in their school and community who speak a language other than English.

Ask students to discuss 'friendship' with a parent/carer or older relation. Students should ask them to describe a close friend and relate stories about the things they have done together in the past. Arrange a series of oral presentations in which students talk about a family friend with these words as a starting point: "My Mum's/Dad's/Auntie's best friend is called ...".

Point out and discuss the technique used to create the illustrations in the selected resource book, e.g. *The Three Questions* uses pen and ink washes; *Oi! Get Off Our Train* uses mixed media. Help the students to draw an act of friendship (such as playing together, talking, helping each other) using the same technique. Ask the students to caption their illustrations.

Acting

Invite a community volunteer to speak to the class about what they do, who they do it for (e.g. charity, hospital, environmental group, social or sporting club) and why they do it.

Suggest to the class that they start a compendium of community skills. Small groups are each to identify five people and ascertain their skills. The people could be family friends, neighbours, relatives, school employees etc.

Help each group to prepare an interview and an interview schedule. Ensure that the students interview any adult with another student and trusted friend present to help them. Remind the students that people normally have special interests and work experiences.

Once the interviews are conducted, ask the groups to co-operate in order to collate the results and decide the best categories and format for the compendium. Invite some of the people interviewed to tell the class about their hobby or profession and to demonstrate a skill.

Ask the students to consider what help they could offer in their community. Pool the suggestions and help the students plan a safe and supervised way to undertake their voluntary work.

Encourage the students to report back to the class when they have undertaken a task.

Communicating

Start work on the friendship quilt. Show pictures of quilts to the students and invite a member of the school community who quilts or sews to provide ongoing in-class support and advice.

Give the students magazines and coloured paper to make a 'paper quilt' collage. In groups, ask them to reflect on the effects of the paper designs, considering the size and shape of the pieces, the relationships between colours, the impact of borders or divisions etc.

Agree on a class plan for the quilt – dimensions, colours, patterns, borders etc. Display the plan, indicating the regions that each student will be working on.

Allocate two pieces of fabric to each student and invite them to bring decorations from home, e.g. buttons, coloured thread, tape. They can decorate their piece of fabric in any way they like – embroidering, painting etc. Another technique is to take digital photographs, or scan existing photographs, of students, then print the images onto special paper which can be ironed onto the fabric. A craft shop can advise you about this technique. Words can also be computer-generated and transferred in this way. One piece of fabric must have a word on it that describes friendship.

Help the students assemble the pieces. You may find it easier to use a backing fabric.

Unveil the quilt at a school assembly. Try and coincide with a relevant special community event such as International Volunteers Day.

Ask the students to write letters of thanks to members of the community who helped them on the project.

Ask each student to make an A4 poster showing one translated word for 'friend' and the language it is from. Make a wall frieze of the posters.

LEARNING AREAS

Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 3 & 4

UNIT DESCRIPTION

Students consider the similarities and differences between feral and native animals, and exotic and native plants. After finding out more about these animals and plants they act to build, restore and maintain local environments with a view to benefiting native plant and animal life. These activities are supported by record-keeping texts and information reports, and are reviewed in recounts.

WORD BANK

domestic, exotic, feral, frogspawn, native, weed

RESOURCES

Print

Slater, P & Parish, S (1999) *Encyclopedia of Australian Wildlife*. Steve Parish Publishing, Sydney.

Hann, J (1991) *How Science Works*. Dorling Kindersley, London.

Burnie, D (1991) *How Nature Works*. RD Books, Sydney.

Websites

www.ea.gov.au
Environment Australia. Go to Biodiversity > Invasive Species > Feral Animals.

www.asxfrogfocus.com
Information about frogs and frog conservation.

www.austmus.gov.au
Australian Museum.

http://amol.org.au/guide/stories/rabbits/index.htm
The story of rabbits in Western Australia.

www.landcareaustralia.com.au
Landcare Australia.

www.greeningaustralia.org.au
Greening Australia.

Engaging

Pets or pests?

Conduct a class survey to find out how many students have a pet.

Combine information from the whole class to complete a table on the board that includes the following headings: Type of pet; Number of pets; Advantages of keeping the pet; Disadvantages of keeping the pet.

Ask the students to consider and discuss: people's feelings for pets; physical care of pets; impacts of pets on the environment if they are not cared for properly; consequences if pets escape.

Invite the students to recount any personal experiences they have had of pets damaging, or causing problems in, the natural environment around their home. Using information from the recounts, construct a simple flow diagram showing the associated environmental impacts of incorrect pet control. (Pet cats make a good focus.)

Feral or friend?

Introduce the word 'feral'. Brainstorm a definition of the term with the class and display the meaning prominently. Ask the students to consider when pets could be described as feral.

Write a list of animals on the board and ask the students to suggest which are feral. Review the list together. Discuss the origins of the feral animals (most have been introduced from overseas or released to combat an agricultural or environmental problem) and the range of impacts they have upon the environment.

Pose the question: 'Can plants also be feral?'. Discuss the idea that a plant can be 'feral' (e.g. an exotic plant or 'weed') when it grows in the wrong place. Brainstorm a list of weeds.

Inquiring

Invite a speaker from a local environmental group, natural history museum or university to come and talk about the impacts of weeds and feral animals on bushland or native wildlife, especially in the local area.

Encourage the students to consider how they could help to remedy the problems caused by feral animals and weeds in the local or school environment.

Acting

Land care and remediation

Organise a day with a local community group when the class could participate in weed-clearing or bush regeneration in the local area. For example your local council, Landcare or Greening Australia group could co-operate with you.

Encourage the students to take responsibility for the upkeep of a part of the school grounds. Organise the students into work gangs to weed an area.

Encourage the class to research, design and then plant a native garden. Include nesting boxes for native birds and small mammals. As an ongoing study, the class could regularly observe and record the different sorts and numbers of wildlife that inhabit and visit the garden.

Building a frog pond

Help the students to build a frog pond in the school grounds. Gather the following materials.

- Pick
- Spades
- A toddler's wading pool
- Sand
- Water
- Bricks or rocks
- Aquatic plants
- Frogspawn.

Support the students to enact the following procedure.

- Choose a site for the pond. Consider shade and proximity to a water supply. Do not have plants overhanging the pond.
- Decide the size of the pond, and mark it out. It should be no deeper than 30 cm.
- Dig out the pond using the pick and spades. Model safe handling and dress conventions. Ensure that there are no sharp objects protruding from the inside of the hole.
- Place the toddler's pool in the hole.
- Put a layer of sand in the bottom.
- Surround the pool with bricks or rocks.
- Fill the pond with water.
- Put in pots of aquatic plants.

Put in frogspawn collected from near your school (but not from nature reserves) or simply wait for frogs to come to the new pool. Do not mix spawn collected from different sites.

Communicating

Co-construct a letter of invitation to an appropriate speaker.

Encourage the students to write information reports about the different types of feral animals and exotic plants in their local area.

Publish students' reports as a classroom resource – for example, a series of *Weed of the Month* posters that depict the species when they are in flower.

Ask the students to write a recount about the time they spent helping to repair a community area.

Jointly design and desktop-publish an observation file to be used when studying the native garden or frog pond. In the file, include a diary page to note down the date and weather conditions, and blank tables to record observations and background information about the different types of animals or plants identified.

UNIT 06: WHO EATS WHAT?

LEARNING AREAS

Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 3 & 4

UNIT DESCRIPTION

Students become ecologists tracking predators and prey in and around a pond, dam, lake, creek or river. Working co-operatively in well defined roles, they research and document information about what organisms eat, and how they live and link together. In the process, they come to understand the interrelated roles of species within food chains and food webs.

WORD BANK

carnivore, consumer, decomposer, ecologist, food chain, food web, herbivore, omnivore, predator, prey, producer

RESOURCES

Print

Burnie, D (1991) *How Nature Works*. Dorling Kindersley, London.

Owen, J (1984) *Mysteries and Marvels of Insect Life*. Usborne Publishing, London.

Slater, P & Parish, S (1999) *Encyclopedia of Australian Wildlife*. Steve Parish Publishing, Sydney.

Slater P & Parish, S (1997) *Amazing Facts about Australian Insects and Spiders*. Steve Parish Publishing, Sydney.

Videos

ABC Education (1987) *Minibeast Environments: Bush Pond*. 15 mins. ABC TV.

Websites

www.gould.edu.au/foodwebs/
Gould League – includes related primary activities and resources.

www.waterwatch.org.au
Waterwatch.

www.streamwatch.org.au
Streamwatch.

www.enchantedlearning.com/biomes/pond/pondlife.shtml
US site with information print-outs of pond life.

www.microscopy-uk.org.uk/pond/
UK guide to identifying pond life.

www.nalms.org/educate/pondgame/plgame.htm
North American game to help identify pond life.

Engaging

Discuss the following scenario with the students.

> Imagine what life would be like without supermarkets or shops: How would you find food? What would you look for? What would you hunt? What if you were being hunted?

Brainstorm a definition for the term *ecologist*.

Write the heading 'Living in water' and ask the students to think like an ecologist. Construct a concept map using students' suggestions of the various life forms that live in, or depend upon, a particular water system, including both animals and plants.

Ask the students to predict the meaning of the term *food chain* and then jointly construct a definition. Make a flow chart of some simple food chains (e.g. sun > grass > cow).

Establish the difference between the roles of the participants in the food chain. Finally, explain that *food webs* are more complex forms of food chains involving more participants and links. Go back to the concept map and draw lines of interdependence.

Inquiring

Ecologist for a day

Create real-life opportunities for the students to practise being ecologists for a day by visiting a waterway. Organise the students into groups of four that will help each other to find out more about the site. Explain that each group member will take on one of the roles below. Brief the class on the responsibilities of each role, then allow individual students to select a job within their group.

Researcher

Identifies what position living things have in a food chain, finding examples of an animal or plant that fulfils each position in an aquatic environment:

herbivore – a plant-eating organism

producer – the source of the food chain, e.g. sunlight

consumer – gets energy by consuming other living things

carnivore – a meat-eating organism

omnivore – an organism that eats both meat and plants

decomposer – an organism that helps to break down dead material, e.g. fungus

predator – an organism that eats other organisms

prey – an organism that is eaten by another organism.

Expert

Finds out more information about the animals and plants that live in a waterway. Puts together a short information report about each animal or plant, including the role it plays in the food chain.

Illustrator

Draws pictures of the plants and animals in the food chain and shows the interrelationships between them.

Problem-solver

Identifies and explains the impact of any problems that would affect a food chain, such as the introduction of an exotic species.

On the excursion

Ensure that all students are familiar with water-safety procedures prior to the excursion. Take field guides, exercise books, tally charts, fishing nets and clean jam jars (to sample the water fauna). Equip the students to draw rough sketches of what they collect and help them to use the field guides to try and identify the variety of species. Ask the students to observe and record the surrounding flora and bird life, and to suggest linkages between the animals and plants in and around the study site. Guide the students' discussions about the likely food chains present in the waterway. Ensure that the students understand that they will need to work collaboratively on their tasks and that everyone should communicate clearly with other members of the team.

Acting

Invite an ecologist from a museum or field studies centre to talk to the class about the different organisms that live in or depend upon a specific waterway in your area. Help the students to formulate some potential questions for the speaker about problems that could affect the balance of the ecosystem and the food chains within it.

Allow time for the students to use the library or Internet to find out more about the variety of different plants and animals present in the waterway, and to write up their findings for their group tasks.

Communicating

Prepare a class presentation of the findings of *Ecologist for a day*. This could take the form of a poster display, slide show or desktop-published booklet. Encourage each student to take responsibility for presenting his or her findings within each group.

Tell the students that the evaluation of each group's presentation will be based upon four different assessments worth 25 points each:

- The teacher's evaluation of each team member's work in the group
- Each group's self-evaluation
- The class's evaluation of the presentation
- Another teacher's or student's evaluation of the overall presentation of each group's material.

Negotiate the criteria that students will consider when calculating another group's points. Suggest questions such as the following.

- Did all the students participate and co-operate in the group activities and discussions?
- Did all the students share their ideas and allow others to share their ideas in an open manner?
- Did each student do his or her part well?
- Were all the tasks of her or his role completed?
- Was the presentation made in an interesting and informative manner?
- Were the group's findings presented clearly with attention to audience and purpose?

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 5 & 6

UNIT DESCRIPTION

Students identify the catchment in which they live and understand the integral role it plays in the health of the local environment. They map their local area using natural boundaries, and conduct research into local catchment issues based on field study and interviews with experts. Research is presented in a range of modes and genres.

WORD BANK

catchment, co-ordinates, geography, key

RESOURCES

Print

NSW Department of Land and Water Conservation (1997) *What Scum Is That? Algal Blooms and Other Prolific Plant Growth*. DLWC, Sydney.

Videos

Murray–Darling Basin Commission (1994) Murray–Darling 'Snapshots' 1, 2 & 3. MDBC, Canberra.

Melbourne Water & The Gould League (2002) *The Catchment Challenge*. Part of 'Drains to Our Waterways' kit. Melbourne Water, Melbourne.

CD-ROM

Commonwealth Science, Information and Research Organisation (1997) *The Bay*. CSIRO Publishing, Melbourne.

Websites

www.mdbc.gov.au
Murray–Darling Basin Commission.

www.nrm.qld.gov.au/education/
Queensland Department of Natural Resources and Mines. Go to Teaching Resources for learning modules that explore catchments.

www.waterwatch.org.au
Waterwatch.

www.environment.gov.au
Environment Australia. A point of entry into a host of environmental agencies and resources.

http://audit.ea.gov.au/anra/
Australia's Natural Resources Atlas.

www.ozgreen.org.au
Oz Green. Events, projects and resources for schools.

BEST COPY AVAILABLE

Engaging

Know your region

Display a map of your region in the classroom.

Refer to the map to point out particular landmarks, towns and features.

Provide students with their own individual maps and have them find and label major towns and waterways as they work through the unit.

Ask small groups to graph the populations of major towns across the region.

Trace the flow of all creeks and watercourses in the region to identify the smaller catchment basins that make up the large catchments.

Current affairs

Organise students into groups and provide each group with a range of news articles that focus on a particular environmental issue (e.g. salinity, soil erosion, water quality, water allocation, water use). Provide students with an opportunity to read and talk about these articles, then hold a class discussion that enables each group to lead the discussion on the issue that they have read about. Record salient points from this discussion for the next activity.

Ask each group to create and present a concept map on their selected issue. Each group should be ready to answer questions posed by the rest of the class.

Inquiring

Negotiate the particular aspects of the selected environmental issue that each group will now research further. Groups' research must include:

- a survey
- an interview with someone affected by the problem
- an interview with someone who works with the community to address the problem
- an information report about the problem
- suggestions to overcome the problem
- presentation of research outcomes that is appropriate to an identified audience.

Acting

Organise to take students on field trips to destinations where the environmental issues under investigation are evident. These field trips could provide interview opportunities with local people. If interviews are to take place, ensure that students are provided with class time to develop and trial questions prior to the visit. Destinations might include: farms, parks, watercourses, riverbanks.

Invite a Waterwatch or Landcare regional co-ordinator along on the excursion or into the classroom to talk and work with students on their research task.

Communicating

Ask groups to present their research in the form of an oral presentation, written information report, museum display, television interview, letter to the editor of the local paper, newspaper or magazine article. Each of the interviews could be presented in a written, visual (video) or oral (audio tape) form.

Ask individual students to draw together the elements of this research to create a literary text that tells a fictional but realistic story.

UNIT 08: LIQUID GOLD

LEARNING AREAS	Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts), Mathematics
UNIT LEVEL	Years 5 & 6
UNIT DESCRIPTION	Students consider aquatic environments and develop their appreciation of water as a finite natural resource. They investigate, represent and annotate the water cycle before conducting a detailed investigation into water-use patterns at home and at school. They support their investigation by producing charts and posters, and clarify their understandings and attitudes in a debate.
WORD BANK	finite, natural resource, water cycle
RESOURCES	Print Barwick, J & J (1998) *Droughts*. From 'Australia's Worst Disasters' series. Heinemann Library, Melbourne. Burnie, D (1991) *How Nature Works*. Dorling Kindersley, London. Seymour, J & Girardet, H (1987) *Blueprint for a Green Planet*. Angus & Robertson, Sydney. Gell, R & Beeby, R (1989) *It's Easy Being Green: Everyday Environmental Practices for Australian Homes and Workplaces*. McCulloch Publishing, Melbourne. Videos NSW Department of Local Government & Byron Shire Council (2000) *Save Our Seppo*. 22 mins. NSW DLG, Sydney. Australian Broadcasting Corporation. *The Big Wet*. 55 mins. ABC Video. Websites www.mdbc.gov.au Murray–Darling Basin Commission. www.waterwatch.org.au Waterwatch. www.streamwatch.org.au Streamwatch.

Engaging

Show the class a snippet from the video *The Big Wet*, focusing on waterfalls at full spate. Ask the students to describe how they felt when they watched the footage. Invite them to recount any personal experiences they have had visiting waterfalls or other large bodies of water. Guide their recollections by asking them to consider where the bodies of water originated.

Introduce the term 'natural resource', and brainstorm a definition. Note the definition on the board. Underneath, list the different forms of natural resources. Ask the class to decide which natural resources we need to enable us to live, and put a tick next to them. Next, ask the students to list the ticked resources in order of priority, beginning with the most important. Question the students to establish why they have prioritised the natural resources in that way.

Introduce the term 'finite' and brainstorm a definition. Ask the students to look at the list of natural resources again and to predict which are finite. Highlight the word 'water' in the list of natural resources and encourage the students to formulate an explanation as to why water is a finite resource.

Inquiring

Make multiple photocopies of a simple diagram of the water cycle and give them out to the class. Divide the students into pairs and invite them to explain to each other, in turn, how the water cycle works. Put up an overhead projection of the same diagram and ask the class to offer short explanations of the different parts of the cycle. Annotate the diagram with their suggestions. Write the short explanations onto the board out of sequence, then ask the students to copy them, in the correct sequence, into their exercise books, using the diagrams as a guide.

Display a one-litre bottle of water. Brainstorm a list of ways in which we use water. Note them on the board. Ask the students to predict how many litres of water they would use, on average, in a day. Draw a bar graph showing the students' predictions. Divide the class into groups and ask them to think about and discuss ways in which people can conserve water.

Acting

Encourage the students to find out how much water they or their family consume daily. The following information can be used as a guide.

Toilet: Flushing uses, on average, 11 litres of water for a single flush and 9 litres of water for a dual flush.

Shower and bath: The amount of water used in a shower or bath can vary considerably. Students can calculate the average that they use by filling up a one-litre bottle at normal water pressure and timing how long it takes to fill. Then they time how long they spend under a shower or filling the bath. (Also use this formula to calculate how much water is used watering the garden, topping up the swimming pool or washing the car with a hose.)

Washing dishes by hand: This typically uses 18 litres of water per wash.

Dishwasher: A dishwasher typically uses 35 litres of water per operation.

Washing clothes: A front-loading automatic machine averages 100 litres per wash, while a top-loading automatic uses 169 litres. A twin-tub requires 40 litres of water.

Hand-washing, teeth-cleaning, drinking, cooking and household-cleaning: On average, one person uses 18 litres of water per day doing these activities.

Help the students to find out how much water is used by the school over a given period. To do this, find where the school's water meter is located, and record the reading at the beginning and end of the school day. Compare and contrast the water usage on a school day, during the night, at the weekend and during a holiday. You could jointly calculate the cost of the water by examining the water bill or asking the local council how much per unit the school is charged and multiplying it by the number of units used. Invite the students to suggest ways in which the school could conserve water, and run a school-wide publicity campaign to encourage the community to participate.

Communicating

Support the students to chart their daily water use. Help them to draw bar graphs to show their predicted water consumption against their actual consumption.

Invite the students to design a poster educating people about ways to save water (for example, turning off all leaking taps in the house or school, or only watering the garden late at night and not in the middle of the day when evaporation rates are high).

Stage a formal debate around the topic: 'Water is more precious than gold'.

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts), Mathematics

UNIT LEVEL

Years 5 & 6

UNIT DESCRIPTION

Students better understand the valuable role of forests and trees in regulating fresh-water quality, providing a habitat for diverse species, providing fuel, medicines and building materials, and supporting recreation and tourism. Through a variety of research tasks, they begin to identify the critical role of sound forest management in a sustainable future.

WORD BANK

bark, cambium, capillary action, evaporation, heartwood, nutrient, phloem, transpiration, water loss, water uptake, xylem

RESOURCES

Print

Burnie, D (1991) *How Nature Works*. Dorling Kindersley, London.

Qld Department of Natural Resources and Mines. *Role of Trees in the Environment, Selective Tree Harvesting, Forest Waterways* and *Forest Wildlife*. Activity booklets. Available in PDF at <www.nrm.qld.gov.au/education/forestmanagement/>. Queensland DNRM, Brisbane.

Slater, P & Parish, S (1999) *Encyclopedia of Australian Wildlife*. Steve Parish Publishing, Sydney.

Murray–Darling Basin Commission. *Murray–Darling Basin Map*. Poster. MDBC, Canberra.

Videos

ABC Natural History Unit (1995) *River Red*. 27 mins. ABC Video.

Websites

www.dlwc.nsw.gov.au/care/veg/index.html
NSW Department of Land and Water Conservation – native vegetation.

www.mdbc.gov.au
Murray–Darling Basin Commission. Go to Education and select Forestry and/or Land Degradation from the encyclopaedia.

www.nrm.qld.gov.au/education/
Queensland Department of Natural Resources and Mines. Go to Teaching Resources to adapt a lower-secondary module on sustainable forest management.

Engaging

Take the class out into the schoolyard, closest garden or park. Have students count the number of trees in the area. Name as many trees as you can. Discuss the students' findings and ask them to suggest a list of benefits that trees provide to humans and other living things.

Draw the outline of a stylised tree on a piece of butchers' paper or sugar paper. Lay it out in a clear space on the floor. Give half of the class a set of single-word labels with a tree-related term on each, such as *root*, *bark*, *leaf* or *trunk*. Give the other half of the class a set of labels that define the terms. Encourage the class to mingle and match up with each other and then lay the labels and definitions on the outline of the tree.

Construct a mind map using students' suggestions about the role of a tree within an ecosystem. Discuss the importance of trees as habitats, wildlife corridors, atmospheric and water regulators, nutrient exchangers and resources for use by humans. Highlight the links in the ecosystem and consider the implications of natural and human-induced changes on the system.

Inquiring

See the forests

Compose a WebQuest to help the students to find out more about the trees growing in Australia. Students could adopt the role of research assistant to the Minister for Forests. The quest should seek to identify:

- the extent of the remaining forested areas within Australia
- the names and locations of the largest forests
- the uses of trees for the pharmaceutical industry
- traditional uses of trees by Aboriginal people
- the types of forests
- the main uses for wood grown in Australia
- current environmental issues affecting one or many forested areas or tree species
- native tree-planting on farmlands.

The students can write their findings in the form of a speech for the Minister. They should then email their speech to two students in another class.

See the tree

Divide the class into groups and conduct an in-depth study of a significant local tree species. For example, students could focus on a study of the river red gum (*Eucalyptus camaldulensis*) and its function as a monitor of environmental changes.

Have each group research a different term from among *bark*, *cambium*, *heartwood*, *phloem*, *xylem* and *capillary action*. Each group must report its findings back to the rest of the class. In its report, each group should identify the relevant area on the stylised tree drawn in a previous activity.

Ask the students to explain how water is cycled through a tree. For example, as water evaporates from the leaves of a tree, more water is drawn up from the roots through a series of capillary-like structures called the xylem. Model an explanatory text, focusing on staging and language features. Highlight and discuss any technical terms introduced, such as *evaporation*, *transpiration*, *water uptake* and *water loss*.

Thirsty trees

Help the students to research the different water requirements of different species of trees. For example, a typical woodland-sized eucalypt may use 40–80 litres of water per day, whereas a large mountain ash may use as much as 600–700 litres. Assist the students to investigate the adaptations of a variety of tree species that enable them to cope with a range of climatic conditions.

Gather information with the students about the latest technological advances that help to monitor water flow through a tree. For example, CSIRO has developed an electronic sensor that monitors sap flow. The sensor works by passing an electrical current into the sap in the xylem and then measuring how long it takes the warmed sap to move a specified distance. Together, mind-map the uses for technologies such as these.

Acting

Native forests

Lead a class excursion to a local forest or wooded area. Divide the students into groups and allocate each group a practical task to complete. For example, one group could identify the different species of trees growing in a specified area. Other groups could measure the circumference of the trees' trunks, estimate the depth of leaf litter surrounding the trees, monitor the flora and fauna living in or around the trees, or measure transpiration (expired water – see below).

Measuring expired water

Gather a number of large, clear, plastic bags and elastic bands. Show the students how to wrap a bag around the branch of a living tree, enclosing its leaves, then hold the bag secure with an elastic band or garden tie. Leave the bag in place for three days, then remove it and measure the volume of water in the bottom. Calculate how much water the whole tree would transpire over that time.

Managed forests

Take the class to a managed forest, logging mill or timber merchant. Help the students to look for cleanly cut tree trunks. Explain that the age of a tree can be calculated from the number of rings on the trunk. Help the students to count the number of rings on several tree trunks and calculate the average age of the harvested timbers.

BEST COPY AVAILABLE

Making paper

Spend an afternoon in the schoolyard with the class making paper from old newspapers. Help the students to tear the old paper into small pieces and then allow it to soak for several days in a large bucket of water until it makes a pulpy soup. Bend some coathangers into circles and tightly stretch some old pantyhose around them to make a deckle. Show the students how to 'trawl' the deckle through the pulp until it is covered with a thin layer and then set it aside to dry. Once the pulp has dried, carefully peel off the sheet of paper. Students may like to add seeds, dye or shells to the deckle to produce a variety of paper textures.

Communicating

Ask the students to:

- write a joint explanation about the processes involved in the movement of water through a tree. Encourage them to add diagrams to help clarify the text; or
- share their findings from the excursion to a forested area via an oral presentation; or
- discuss the implications of their findings and produce a document assessing the whole area, including information reports, graphs and tables; or
- publish an information report about a particular species of tree on home-made paper.

Support students to use the knowledge that they have gained within the in-depth tree study to write an exposition entitled 'Aboriginal people should advise the government on forest management'.

Invite students to participate in the debate 'Harvesting old-growth forests is not sustainable'.

LEARNING AREAS

Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts), Studies of Society and Environment (NSW: HSIE)

UNIT LEVEL

Years 5 & 6

UNIT DESCRIPTION

Students consider the size of their 'footprint' upon the earth, identifying which practices and actions have the greatest environmental impact. They assess what responses will be most effective in minimising environmental damage. Students use the 'walking school bus' model to plan and implement a campaign aimed at reducing greenhouse gas emissions, culminating in a Walk to School Day.

WORD BANK

ecological footprint, fossil fuel, global warming, greenhouse effect

RESOURCES

Print

NSW Environment Protection Authority (2002) 'In the Picture'. Active for Air resource sheet. NSW EPA, Sydney.

Powerhouse Museum (2002) 'Ecological Footprint'. *EcoLogic* information sheet. Available in PDF at <www.phm.gov.au/ecologic/>. Go to Teachers & students > Print materials. Powerhouse Museum, Sydney.

Whitty, H (2001) *Travel and Transport*. 'Eco' series. Macmillan Education, Melbourne.

Whitty, H (2001) *Community*. 'Eco' series. Macmillan Education, Melbourne.

Videos

Department of Primary Industries and Energy (1993) *Saving Hieronymus*. School education kit. AGPS, Canberra.

Quinnell, K (1992) *Greenhouse Warming: Causes, Changes and Cures*. 16 mins. Classroom Video, Sydney.

Websites

www.greenhouse.gov.au
Australian Greenhouse Office. Includes resources for schools.

www.phm.gov.au/ecologic/
Powerhouse Museum. An interactive online game and the first ecological footprint designed for Australians using local data.

www.earthday.net/footprint/
Redefining Progress – an international organisation promoting sustainability. Offers a simple and thought-provoking quiz to determine the size of an individual's 'footprint' on the earth.

www.epa.nsw.gov.au
NSW Environment Protection Authority. Includes Active for Air resources for primary schools (see the 'Resource centre').

www.walkingbus.com
British site that promotes safe walking routes to schools.

www.walktoschool-usa.org
Walk to school site from the USA.

www.epa.gov/globalwarming/kids/
Environmental Protection Authority (USA). Includes resources for teachers, explanations of scientific terms and simple games.

Engaging

Brainstorm changes that people can make to minimise problems in the natural environment. List all suggestions on the board.

Ask students to consider which of these changes would make the biggest difference to the future of the world. How could they assess their impact?

Ask students what they know about the term 'greenhouse effect'. Explain the theory using the greenhouse analogy. Note that there is some continuing debate amongst scientists over the impact of global warming.

Form students into small groups to discuss the potential impacts of global warming. Have each group represent its discussion as a consequence chart. Compare students' ideas with CSIRO predictions that, in this century, there could be: a rise in temperature of 1–6°C; more storms, flood and hail; higher sea levels; more weeds, pests and diseases such as malaria; more droughts and soil erosion; a change in ocean currents.

Ask the small groups to predict how global warming might change their life if they were a:

- farmer in South Australia
- tourist operator in Tasmania
- postal worker on a tropical island in the Pacific Ocean
- state emergency worker
- three-year-old child living in Brisbane
- three-year-old child living in East Timor
- ski instructor in Victoria
- surfboard rider in Western Australia.

Lead whole-class reflection. Who is causing the problem? Do some people 'win' by climate change? Who loses? What will be the impact on their lives?

Explain that significant amounts of greenhouse gases are released by burning fossil fuels such as coal, oil and gas. Have the students, still in their groups, map out all the things they do in the day. Against each activity, have them mark whether it uses a fossil fuel. Support this task as appropriate (for example, most electricity in mainland Australia is generated by coal-fired plants). Ask groups to suggest what personal changes would make the most difference to the emission of greenhouse gases.

Inquiring

Ecological footprint

Enable the students to complete an online quiz (see Resources) to calculate their 'ecological footprint' – the size of their impact on Earth. By playing the quiz a number of times and varying their replies, students can evaluate which areas of consumption (e.g. home, travel, size of meals) make a significant difference to the size of their 'feet'. Note that transport is a key area where individual and community action can make a significant difference to greenhouse emissions and ecological impact.

Car use

Ask each student to record any car trips they make for one week. This record should include where they went, what they did, how long it took to park, where they parked, and the number of passengers in the car.

Collate the student records. As a class, decide on categories for the first set of information – *where they went*. (For example, many students might use the car to come to school, go to the shop, attend sporting events etc.) Then ask students, in small groups, to look at each of the other record sets in the same way, until each set of information has a range of categories against which all students' records can be tallied. Use the categories to collate and then analyse all data. Support students to use a computer spreadsheet application to enter and represent these data.

Set a WebQuest that requires the students to investigate schools around the world that have made a 'walking school bus'. For example: *You are a town-planning company that has been approached by the local council to mark out safe walking routes to the school that can be used by all students who are within walking distance. The council has heard about 'walking school buses' in other places, and wants you to investigate this approach.* Suggest that students could email schools with 'walking bus' programs to exchange ideas and information with other students.

Acting

Making a car-trip diary

Help students to build on their experiences in the inquiring phase by designing and making a car-trip diary to be used over one targeted week by every child and adult attending the school. To begin, ask the students to work in pairs to evaluate the car-use records that they kept, noting ways to make them easier to complete (for example, should symbols be used?). Each pair should join with another pair to further refine the diary design, and so on, until a whole-class approach is developed.

Divide the class into four working groups.

Production group

This group is responsible for:

- writing the text of the diary
- desktop-publishing the diary
- revising their work based on the recommendation of the evaluation group.

Evaluation group

This group is responsible for:

- reviewing the text of the diary
- testing a prototype diary with selected students and teachers
- reviewing the revised diary.

Promotion and distribution group

This group is responsible for:

- raising awareness of the diary through an article in the school newsletter
- composing a note to be sent home with the diary
- enlisting the help of key students in other classes
- using the 'buddy group' system within the school to promote the diary.

Implementation and collection group

This group is responsible for:

- ensuring that the maximum number of participants complete the diary during the targeted week
- co-ordinating the collection of diaries at the conclusion of the survey.

Collate all the information from the diaries using the categories developed in the inquiring phase. Once the results are tallied, ask the students, in small groups, to generate recommendations for reducing dependency on the car. These might include car-pooling, planning ahead, walking, bike-riding, using public transport. Ask groups to put their recommendations forward for whole-class debate – some suggestions may be dangerous or impractical. Encourage the class to agree upon the most important priorities for action.

Communicating

Encourage the students to plan a publicity campaign based on their highest-priority recommendations. For example, the students may decide to paint or desktop-publish a series of posters, email an e-card to their friends or other schools, or publish a newspaper setting out their data and featuring interviews with people who walk, ride or catch public transport. Support the students to create stickers or flyers that can be distributed on Walk to School Day (see below).

Publish the results of the school car-trip diary as a series in the school newsletter.

Help the students to write a press release to send to the local paper, inviting a reporter to visit the school and interview class representatives. Advise the students to prepare for the interview by preparing brief messages that make their point clear and catchy. (Note: parental permission for any interview will be required.)

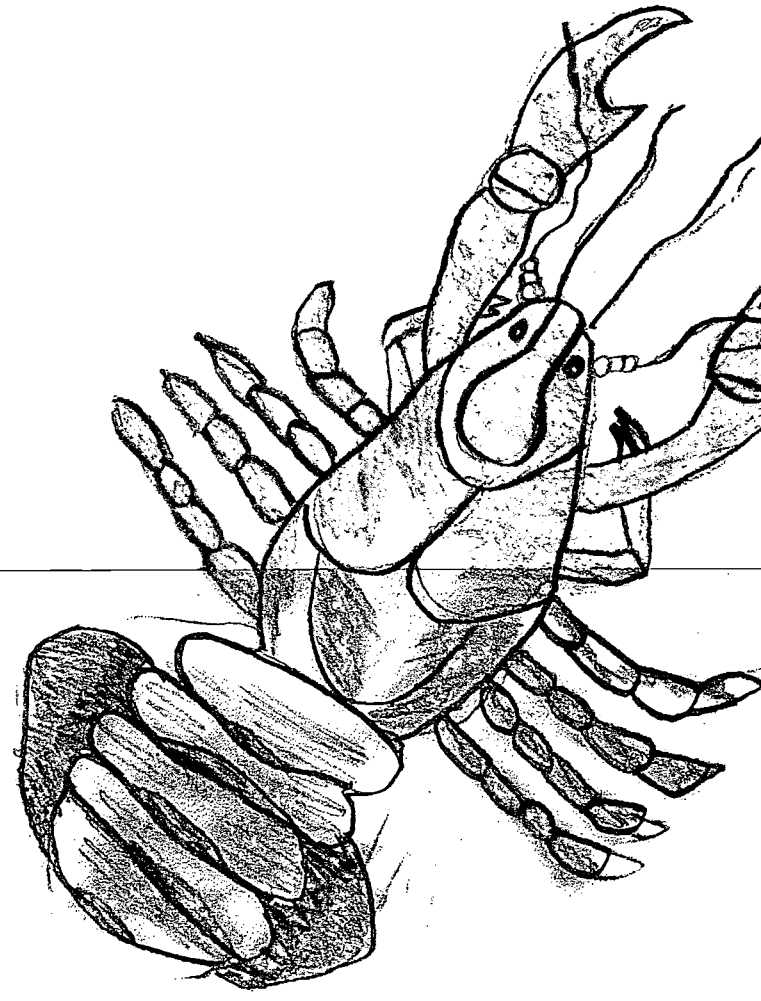
Organise a Walk to School Day that involves the whole school. Prepare for the event by jointly mapping the local neighbourhood and identifying the best and safest route. 'In the Picture' has some good suggestions for this mapping activity (see print resources).

Display the results of the publicity campaign in the school library.

BEST COPY AVAILABLE

Unit 11: Making Sense
Unit 12: Going Green
Unit 13: Down the Gurgler
Unit 14: Resources, not Rubbish
Unit 15: Saline Solutions
Unit 16: Eyes in the Sky
Unit 17: Where Does Your Water Come From?
Unit 18: Splash!
Unit 19: What's Bugging Your Water?
Unit 20: Wonderful Water!

MANAGING RESOURCES



LEARNING AREAS

Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts), Studies of Society and Environment (NSW: HSIE)

UNIT LEVEL

Years 1 & 2

UNIT DESCRIPTION

Students heighten their appreciation of the senses as they interact with their local environment. They design, make and play sensory bingo, compose a soundscape, portray nature using 'close focus', and target areas for observing wildlife. As they develop greater sensory awareness, they gain first-hand experience of some communication and movement systems needed by people with a physical disability.

WORD BANK

disability, hearing, palette, sight, smell, taste, touch

RESOURCES

Print

Apeitos, S (1995) *Two Left Feet*. Angus & Robertson, Sydney.

Clark-Giles, T (1996) *Rock and Roll Clyde!*. Era Publications, Adelaide.

Dickins, R (1992) *Boris the Bat*. ABC Enterprises, Sydney.

McIntosh, H (1993) *Grandpa's Had a Stroke*. CVA Publications, Melbourne.

Mattingley, C (1994) *The Race*. Scholastic, Sydney.

Wignell, E (1993) *I Wonder Who Lives Upstairs?*. University of Western Australia Press, Perth.

Websites

www.disability.vic.gov.au
Disability online.

Engaging

Divide the class into five groups. Give each group some butchers' paper. Help groups to draw a body outline of one group member on the paper.

Prompt the students to tell you the five senses. Then ask each group to use different-coloured crayons to mark the outline with the different organs that are the sites of our senses, e.g. blue – sight, red – taste, yellow – smell, green – hearing, pink – touch.

Play a sensory game such as Pin the Tail on the Donkey, Marco Polo or Who Dares?.

Marco Polo

Go into the playground and ask the class to form a circle by holding hands. Three students stand within the circle. One is blindfolded. The other two must continually say "Marco Polo" (loudly or softly). The blindfolded student tries to locate and catch the others within the circle.

Who Dares?

Gather small samples of different sorts of food, e.g. cheese, chocolate, bread, jelly, apple, carrot. Select two volunteers. Blindfold one student (the taster) and give the other a clean pair of tweezers (the scientist). The scientist feeds the taster, asking the taster to identify the foodstuff and noting whether their guess is correct. Try a variation and ask the taster to hold their nose as well.

Tell students that they will explore nature's palette (range of colours) in the playground or at a familiar nearby park. You will need colour charts from a hardware or paint shop, blank sheets of A4 paper, coloured pencils and graphite pencils. Distribute the paper and ask them to outline a geometric pattern that represents the park/playground. Then ask them to use their coloured pencils to shade in the pattern with the colours that they think they are likely to find.

Take the students to the local park or into the playground. Hand out a selection of paint cards and one pencil to pairs of students. Ask them to try and match every colour on their card with any natural or made item they find. They should draw the shape of the item on the colour card with their pencil.

Back in the classroom, ask students to compare their geometric pattern with their paint cards. Were there any surprises?

Introduce the topic of people with a disability by reading books on this theme (see print resources).

Inquiring

Sensory walk

Take the class into three different locations in the playground. Ask them to sit quietly, close their eyes and:

- listen – what do they hear: heartbeats? each other? students in other classes? traffic?
- feel around where they are sitting – is it rough, smooth, dry?
- smell – is it pleasant or unpleasant?
- poke out their tongue – what can they taste in the air?

In the classroom, regroup students into five working parties. Each group is to adopt a sense and write a list of words that can be used to describe the way things *smell* or *look* or *feel* or *taste* or *sound*. Encourage each student to write a poem about the senses using these words.

Sensory bingo

Help the students to prepare individual bingo cards using a computer.

Students use the word processor's table function to create a ruled table with six columns and six rows.

In any cell, students put one of each letter of the word S-E-N-S-E-S. In each of the remaining cells, they type either 'sight', 'taste', 'smell', 'hearing' or 'touch' until all the cells are filled. Students can decide how many of each sense they place (demonstrate the copy and paste functions). Each student prints out their completed table.

The 'sense' groups reassemble and type out their adjectives, formatting the text in bold and sizing it at 24 point. Support students to use the spell check, dictionary and thesaurus functions. The groups then print and cut out each adjective and give it to you. Any scrap paper can be cut up to create markers that will be used to cover their cards.

Shuffle the adjectives and get ready to do the calling. Explain the rules of Bingo. Instruct students to find the sense that matches the adjective. For example, when you call out 'smooth', they cover 'touch'. They can cover more than one sense if they think their adjective applies to more than one, e.g. 'sweet' could apply to 'smell' and 'taste'. The S-E-N-S-E-S letters are free spaces that can be covered whenever a student is unable to match an adjective with a sense. Whoever fills their card first calls out 'Bingo!'.

Listen up!

Tape a selection of sounds to play to the students in class. Ask them to guess whether the sound is natural or not. Explain that non-natural sounds are made by *technology* – things made by humans. This could include a car, pencil or clarinet. Natural sounds are made by nature, and include animal calls, wind in leaves etc.

Ask students to rule two columns on a sheet of paper. On the top of one, they draw a square to signify 'non-natural'. On the top of the other, they draw a circle to signify 'natural'. Play the tape, announcing the number of each sound. Ask the students to number and record (draw or write) the sound in the correct column. At the end of the tape, discuss the sounds in sequence, and the reasons for each classification.

Form the students into pairs and give each pair an A4 piece of paper. Ask them to divide the sheet into five rows. Take the students on a walk, in their pairs, across the playground. Make five stops. At each stop, ask the students to close their eyes, listen, and record the sounds they hear using either a square (non-natural) or circle (natural) across one row – the louder the sound, the bigger the symbol. Review the resulting sound maps back in the classroom.

Disability awareness

Discuss the ideas of ability and disability. Help students to recognise that people are commonly able to: sense or recognise things; perform everyday activities such as eating, dressing, moving around; communicate and socialise with others; do things that other people of their age usually do; learn, understand and remember things. Help students to recognise that a person with a disability might find it difficult, or might need support, to do some or all of these things.

Invite a person with a disability to speak to the class about their life and/or work. Arrange for a sign language interpreter if necessary. Investigate the availability of performers who have a disability (e.g. Theatre of the Deaf).

Ask the working parties to reform and extend their research to consider how someone with a disability interacts with their environment. Any people with a disability within the school community can become expert advisors in this part of the unit.

Hold a forum where the students can discuss what they learnt about their senses and how important each of the senses is. Discuss what the community can and does do to help people with a disability. Ensure that the students are aware of the contributions that people with a disability make to the community.

Acting

Soundscape

Ask students, back in their initial groups, to compose a soundscape based on the sounds of the school environment. They could 'hum' the natural sounds and use percussion instruments to make the non-natural sounds.

Disability awareness

Teach the class the signing alphabet. Point out and discuss features such as the treatment of vowels. Discuss the relationship between the hand gestures used for consonants and the equivalent printed letters.

Obtain a sample of Braille script to pass around the class. Discuss ways in which the script is similar to, and different from, conventional print.

Borrow a wheelchair from a local community centre. Select three students to link with a responsible older student – for example the school captain or a prefect – and test the accessibility of the toilets, grounds and classrooms. Ask the selected students to report back to the class.

Ask the students to consider other ways to test whether or not their school would be welcoming for a person with a physical disability. Help them put their tests into practice. Discuss the results and decide whether improvements can be made to the school. Help the students write a letter to the parent body with their recommendations.

Putting senses to other work

Invite an ecologist who spends time observing native animals in their habitat to speak to the class. Ask the guest to focus on techniques used to observe animals, and on the senses that animals use to detect danger.

Divide the playground into five observation grids. Allocate one group to each grid. Provide time each week for groups to use all their senses to observe animal, bird and insect life in their grid. Help the group to prepare observation sheets so they can record/draw: date, time, type of creature. At the end of the unit, help students to tally their observation sheets and prepare a report. Collate the reports into a Record of School Wildlife.

Take the students to the playground, nearby park or area of native bushland. Stretch five pieces of string (say 3 m each) along the ground in different areas. Give each group a magnifying glass to inspect the trail marked along the stringline. Each student is to draw the most interesting thing they can see through the magnifying glass. Back in the classroom, ask groups to design and make a poster based on the magnified images. Ask them to annotate their poster and mount a display of their work.

Communicating

At a school assembly:

- Perform the soundscapes.
- Recite the poetry.
- Encourage the students to sign a welcome.
- Present the Record of School Wildlife to the principal.
- Display the colour palette paint cards as a huge wall collage. Samples of plants can be added.

Help the students make improvements to the design of their sensory bingo cards – thicker card, different fonts, tactile border etc. Use the improved versions to play the game with another class.

UNIT 12: GOING GREEN

LEARNING AREAS

Science (NSW: Science and Technology), Studies of Society and Environment (NSW: HSIE), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 1–6

UNIT DESCRIPTION

This unit focuses on riparian and waterway quality, with students using bird life to assess the health of the environment. Younger students create a pamphlet advising how to create and sustain bird habitats, and record birdsong. Older students undertake scientific experiments and report their findings using a variety of notations.

WORD BANK

flow rate, introduced, native, remediate, riparian, transect, waterway

RESOURCES

Print

Simpson, K & Day, N (1999) *Field Guide to the Birds of Australia.* Penguin Books, Melbourne.

Gell, R & Beeby, R (1989) *It's Easy Being Green: Everyday Environmental Practices for Australian Homes and Workplaces.* McCulloch Publishing, Melbourne.

Seymour, J & Girardet, H (1987) *Blueprint for a Green Planet.* Angus & Robertson, Sydney.

Websites

For lower-primary students:

www.birdsaustralia.com.au
Resource of Australian birds.

www2.abc.net.au/science/birds/
Backyard Birdwatch (ABC).

For middle-primary students:

www.waterwatch.org.au
Waterwatch.

www.streamwatch.org.au
Streamwatch.

For upper-primary students:

www.seda.nsw.gov.au
Sustainable Energy Development Authority.

www.sustainable.com.au
Sustainable Earth Technologies. Company offering environmental design/ construction/planning services.

www.rosneath.com.au
Rosneath Farm – an eco village in WA.

YEARS 1–4 STUDENTS

Engaging

Ask how many students keep pet birds at home. Encourage individual students to describe what type of bird(s) they keep – including whether they are native or introduced birds – and the routines they follow to care for them.

Discuss the difference between the terms 'native' and 'introduced'. Ask the students to name common examples of each type of bird. For example, sulphur-crested cockatoos are native species, while Indian mynah birds are introduced.

Inquiring

Help the students to locate the closest waterway on a large map. Discuss the type of environment surrounding the waterway; for example, describe the characteristic features of a wetland, farm paddock or forest.

Ask the students to predict the types of birds that could be found living in and around their local waterway. Highlight some of the characteristic features of waterbirds, such as the adaptations of their feet and beaks that help them live in a watery environment.

Acting

Organise a class excursion to a local waterway and observe the birds present there. Before going, compile a simple observation sheet that the students can use to record information about the different types of birds they see.

While on the excursion, divide the students into pairs and encourage them to play a game called 'Name That Noise'. Each student takes a turn sitting, eyes closed, and listening carefully to the sounds around them. They then have to describe each sound to their partner and point in the general direction of the sound.

Communicating

Create a class pamphlet outlining the ways in which students can encourage more birds into the schoolyard. Help the students to create a bird-friendly environment by planting bird-attracting shrubs and flowers.

Take the students into the school grounds and show them how to record various bird songs on a tape recorder.

YEARS 5–6 STUDENTS

Engaging

Locate and name all the local waterways on a large-scale map of the area. Discuss the types of problems that individual waterways may experience, such as pollution, contamination, reduced flow rates due to irrigation demands, or periods of algal bloom due to high phosphate run-off.

Explain that in order to care for, or remediate, a waterway, people need to assess what is already happening to it. Point out that farmers, ecologists and hydrologists work together to do this.

Inquiring

Help the students to research and formulate a series of experiments they could do to assess the health of a local waterway. Some of the experiments could include:

- analysis of the water's quality, including its turbidity and/or acid levels
- quadrat analysis of the flora or fauna on the water banks
- a key of the local flora or fauna in or surrounding the waterway
- a study of water-bank erosion
- measuring the shape of the waterway's channel by taking a transect
- measuring the flow rate of the water (see below for further details).

How to measure the flow rate of water

Follow this procedure.

Gather ping-pong balls and stopwatches.

Organise the students into pairs.

Station one student at a particular distance, for example 50 metres, upstream from the other.

Give the upriver student a ping-pong ball and the downriver student a stopwatch.

Ask the students to wade carefully into the water to a safe depth.

The upriver student releases the ping-pong ball at the same moment as the downriver student starts the stopwatch.

The downriver student times how long it takes for the ping-pong ball to reach her or him.

By dividing the time taken by the ping-pong ball to float downriver by the distance travelled, the students can work out the flow of water per second.

Acting

Go to a local waterway and conduct the experiments.

Invite a water expert to discuss the results and conclusions drawn by the students.

Communicating

Encourage the students to take part in a web-based water survey (see web resources for further information).

Demonstrate the range of options students could use to present their data, including graphs, tables, maps, sketches, procedural recounts and information reports. Help the students to collate their data into a relevant format and display their finished results in the class.

UNIT 13: DOWN THE GURGLER

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 3 & 4

UNIT DESCRIPTION

Students look at the visual indicators of water pollution before developing a bank of associated terms. They consider a range of practical ways through which they could minimise the effects of water pollution, with a focus on biodegradable cleaning products. They learn about water-treatment activities and investigate consumer attitudes before preparing their own biodegradable laundry soap. They develop and display their understanding via a range of visual and written texts.

WORD BANK

biodegradable, catchment basin, chemicals, contamination, ecosystem, fertiliser, litter, nitrogen, phosphate, run-off, salinity, sewage, water cycle, water table

RESOURCES

Print

Burnie, D (1991) *How Nature Works*. Dorling Kindersley, London.

Gell, R & Beeby, R (1989) *It's Easy Being Green: Everyday Environmental Practices for Australian Homes and Workplaces*. McCulloch Publishing, Melbourne.

Hann, J (1991) *How Science Works*. Dorling Kindersley, London.

Seymour, J & Girardet, H (1987) *Blueprint for a Green Planet*. Angus & Robertson, Sydney.

Videos

Melbourne Water & The Gould League (2002) *The Catchment Challenge*. 10 mins. Part of 'Drains to Our Waterways' kit. Melbourne Water, Melbourne.

Murray–Darling Basin Commission. *Blooming Algae*. 22 mins. MDBC, Canberra.

Warringah Council & Stormwater Trust NSW (1999) *Wake Up Call*. Oz Green.

Websites

www.mdbc.gov.au
Murray–Darling Basin Commission.

www.waterwatch.org.au
Waterwatch.

www.streamwatch.org.au
Streamwatch.

Engaging

Display some images or video clips showing a polluted waterway and a pristine waterway. Ask the students to describe their feelings when they look at each image. Note the descriptions on the board. Ask the students to suggest how a pristine waterway could become polluted. Lead a discussion about actions that lead to polluted waterways, and the effects that pollution has on other components of the ecosystem.

Build a brainstormed word bank of terms associated with water pollution. Include terms such as those listed in the word bank. Illustrate the terms with diagrams and definitions. Display them around the classroom.

As a class, view video resources such as those listed above. To facilitate note-taking from the videos, have the students fold a sheet of A4 paper in half. Ask the students, on one side, to write 'I already knew that ...', and on the other side 'What I learned is that ...'. Encourage the students to build up notes while they watch. Later, allow them to share their thoughts and to pose questions that they can research further.

Inquiring

Invite an expert in water management to talk to the class about the environmental issues associated with water pollution and the things that people and communities can do to reduce it.

Encourage the students to keep a diary for a week and to jot down ways in which they and their families add to the problems of water pollution. Discuss these with the class and brainstorm some positive ways of reducing the problem. Emphasise the positive action of using biodegradable household products and then ask the students to survey the cleaning products used in their home to find out if they already use them.

Guide the students to use school resources to locate a range of household recipes that use everyday products, such as lemon juice and vinegar, to create biodegradable cleaning agents.

Acting

Visit the local sewerage works or water-treatment plant. Encourage the students to talk with the guide to establish what sorts of items actually end up down sewers. Encourage the students to sequence the stages of sewage treatment on an activity sheet.

Go to the local supermarket with the class and identify a range of biodegradable cleaning products. Then help students to survey shoppers in the local community to find out their level of awareness regarding water pollution, and if they buy biodegradable products.

Help the class to make its own biodegradable laundry soap. Ask each student to bring in a clean jam jar, labelled with his or her name, so they can take a sample home and use it.

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How to make biodegradable laundry soap

Gather the following materials.

- Old saucepan
- Stove
- Cake of pure soap
- Water
- Potato masher
- Cup
- Washing soda
- Fine strainer
- Three buckets

Support the students to follow these directions.

- Cut a cake of pure soap into small pieces.
- Place the pieces in the saucepan with a little water and bring to the boil until melted.
- Mash with the potato masher.
- Put one cup of washing soda in a bucket and dissolve with a little hot water.
- Strain the soap solution into the bucket and mix together well.
- Divide the solution into three buckets and top up with water.
- Once the solution is cool, fill jam jars. The solution will set into a soft gel.

Note: Use two cups per wash.

Communicating

Divide the class into small groups and invite each to draw a large cross-section of a house. Ask the students to label the areas in the house where pollutants might enter the water system. Display the completed drawings around the classroom.

In a public area of the school, create an exhibition displaying a range of environmentally friendly cleaning products. Jointly construct information reports detailing information about each item. In each report, include the item's brand name, price and ingredients. Collate the results from the students' supermarket surveys and record their findings in a variety of graphs. Add them to the exhibition with an explanation of how, where and when they were collected. Also, provide a range of free information leaflets about positive actions that other members of the school and local community can take to reduce water pollution.

Compile a class book of biodegradable recipes that use everyday ingredients. Students may like to ask older members of their families or the community to contribute a recipe.

LEARNING AREAS

Science (NSW: Science and Technology), English, Mathematics, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 3 & 4

UNIT DESCRIPTION

Students reflect on community patterns of consumption and disposal, with a focus on resource issues at school. They investigate the life cycles of familiar products, identifying materials and energy resources that are renewable and non-renewable. They use their understandings to employ practical waste-reduction strategies which they model at a community picnic.

WORD BANK

aluminium, cradle to grave, disposable, environmental design, landfill, life-cycle analysis, non-renewable, plastic, renewable

RESOURCES

Print

Gell, R & Beeby, R (1989) *It's Easy Being Green: Everyday Environmental Practices for Australian Homes and Workplaces.* McCulloch Publishing, Melbourne.

Gould League of Victoria, EcoRecycle Victoria & Environs Australia (1998) Waste Stoppers Program information sheets. Available in PDF at <www.gould.edu.au/waste_stop/act_intro.htm>. Gould League of Victoria, Melbourne.

Ryan, J C & Durning, A T (1997) *The Secret Lives of Stuff.* North West Environment Watch, Seattle, WA.

Seymour, J & Girardet, H (1987) *Blueprint for a Green Planet.* Angus & Robertson, Sydney.

United States Environmental Protection Agency. *The Quest for Less: Activities and Resources for Teaching K–6.* Available in PDF at <www.epa.gov>. Go to Educational Resources > Teachers > Curriculum Resources > Waste and Recycling. US EPA, Washington, DC.

Videos

EcoRecycle Victoria (2000) *Your Planet, Your Choice.* EcoRecycle Victoria, Melbourne.

Keep South Australia Beautiful (1993) *Reduce, Reuse, Recycle.* KSAB, Adelaide.

School Communities Recycling All Paper (1999). *If You Didn't Eat Your Greens.* 9 mins. SCRAP, Sydney.

CD-ROM

Cyber Up Productions (1996) *Alphaville: An Eco Adventure.* Department of Education, Employment and Training, Victoria.

Websites

www.epa.gov/osw/kids/
US Environmental Protection Agency. Pages for both teachers and students.

www.howstuffworks.com
Comprehensive exploration of how things work.

www.northwestwatch.org/pubs/stuff.html
Teachers' guide to using *The Secret Lives of Stuff* (see 'Print' above).

www.ecouncil.ac.cr/rio/focus/report/english/footprint/
'Ecological Footprints of Nations: How Much Nature Do They Use? How Much Nature Do They Have?'.

http://compaq.com.au/composting/
A step-by-step guide to composting at school.

www.cleanup.com.au
Clean Up Australia. Includes interesting statistics on waste.

www.phm.gov.au/ecologic/cycles.htm
The industrial cycle of a Kettle chip packet.

www.ozline.com/webquests/intro.html
Introduction and rationale for WebQuests.

http://webquest.sdsu.edu/
Support and examples for implementing a WebQuest.

www.ecorecycle.vic.gov.au > Education > Schools
EcoRecycle Victoria – resources for schools.

www.gould.edu.au/wastewise/
Waste Wise Schools. Class materials include a unit called School Litter Busters.

www.scrapltd.com.au
School Communities Recycling All Paper (SCRAP) – advice and kits on waste reduction, recycling and re-use.

Engaging

Display a variety of familiar products derived from renewable and non-renewable materials. Products could include paper and cardboard goods and/or wooden furniture; cotton or woollen clothing; coal heat beads; gold or diamond jewellery; copper coins or wire; steel tools; aluminium pans; glass bottles or mirrors; rubber tyres; plastic milk containers or shopping bags; fruit, vegetables and grains.

Ask students to speculate about what each item might be made from – its main *material*.

Discuss the meaning of the terms *renewable* and *non-renewable*. (Note: renewable resources can be replenished over time; non-renewable resources cannot – or can only be replenished very slowly, e.g. fossil fuels.)

On the board, draw two columns headed 'Renewable' and 'Non-renewable'. Consider each material identified by the class. Write each in the column that the class agrees is appropriate. Leave the list in place and invite the students to change the category if they discover their guess was incorrect. Enlist a class helper to record any questions that arise from the discussion.

Divide the class into groups of five. Give each group a plastic bag, a paper bag and a string bag. Explain that each bag has a life of its own from *cradle to grave*. For each bag, ask groups to consider, suggest and document:

- what it is made from
- how it is made (processed)
- how it is distributed
- how it could be used
- whether it could be re-used or recycled
- what happens to it at the end of its life
- whether it has a life after it is thrown away.

Highlight the complexity of product life cycles by focusing on the first two points (what it is made from; how it is made). This can be supported by viewing the source materials and production processes for a packet of Kettle chips at <www.phm.gov.au/ecologic/cycles.htm>.

Invite students to reconsider their suggestions of materials and processes for the three types of bags. What further information could they now identify?

Inquiring

Ask students to bring their favourite toy to school. Ask them to describe to a partner what they were doing, and how they felt, the last time they played with it.

Form the students back into their small groups. Ask each group to investigate one selected toy in terms of its product life. To represent their findings, have groups draw a poster-sized picture of their toy and label its different parts, including the raw materials used. Ensure that they consider:

- how the materials are obtained
- where the materials come from
- how and where the materials are processed.

Pin the five posters around a class map of the world. Using drawstring lines to connect the map with each poster, plot the locations that each toy and its parts come from.

Visit a selection of local shops (supermarket, hardware store, toy store) to research where products come from. Discuss the wording 'Made in Australia' to clarify what it means.

Invite grandparents, carers and neighbours (including those who have come from other countries) to visit the class and talk about their lives when they were young. Support students to devise questions such as the following.

> Did they have many toys? Where did the toys come from? What were they made from? Did people make their own toys? What were some of the happy memories from their childhood? What current products were not available when they were growing up? Did they re-use or repair items?

Encourage the students to consider whether life is better as a result of owning and consuming more things.

As a class, identify some products that are designed to be thrown away, or that have a very short life (e.g. newspapers, toothpicks, disposable nappies, paper towels). Discuss the benefits and costs of each.

Ask students to discuss what happens to products that are not re-used or recycled. Explain the meaning of *landfill*. Locate the nearest landfill site.

Look at how your local area treats its rubbish and consider alternative forms of disposal that recycle or re-use the materials. Information could be gathered from a:

- guest speaker from the waste-management department of the local council
- visit to the local tip and/or recycling yards, to a home displaying exemplary composting, to a charity shop that resells used clothes, toys etc.

Acting

Inform students that they are going to investigate the materials that the school throws away in a year, and where this rubbish goes. Working parties of 3–5 students would be an effective arrangement to plan and carry out the study. Estimates will need to be made from daily or weekly disposals.

Start with a guessing competition: ask students to guess how much (by weight) each person in the school throws away in a year. Jointly identify how many people on average (students, teachers, office staff, maintenance staff, support staff, visitors etc.) are at the school each day.

Identify all the people in the school who can help with this task.

Jointly discuss and identify strategies that might support the task. For example, garbage can be classified and measured in terms of *recyclable*, *non-recyclable* and *hazardous*. The waste from morning tea and lunches will be significant and can probably be extrapolated over a year from safely collecting, sorting, weighing and analysing waste for one day.

Teach and explicitly demonstrate safe handling practices, e.g. identifying sharp, toxic or otherwise hazardous materials; wearing thick, long gloves.

Ask each group to develop an action plan based on interviews with key staff and a review of alternative strategies. View the plans and provide appropriate feedback.

Help the groups to enact their action plan over a week.

Ask students to compare their results with their original estimates.

Remind the students that the school uses other resources, such as electricity and water, every day. Investigate how much of each your school uses annually.

Help your students to follow the recycling path for paper, glass and aluminium. What happens after they are collected? Conduct a WebQuest on the Internet to follow the recycling path for plastic (see website resources for useful information about WebQuests). For example, the challenge might be:

You are a strategic solutions team that has been hired by a major supermarket chain to devise a new line of 'green' plastic bags. Use Internet research to prepare your solution. Present it as a web page or PowerPoint presentation.

Teach students that one of the most important things we can do is to create less rubbish in the first place. Ask the students to list all the things they currently do that makes less waste. What else could they do?

Suggest that the school start to compost its food scraps (see Resources for ideas and support). Have the students, in dedicated research groups, take responsibility for proposing the best: location (e.g. indoor/covered, outdoor/uncovered), method (e.g. heap, garbage cans, worm bins, rotating drum) and organisation (e.g. routines, responsibilities) for composting. As a class, determine an agreed process and seek to implement it with the support of the school community.

Identify and list five things that the school throws away. Ask the students to think of three ways that each could be re-used.

Communicating

Exhibit the results of the students' research at a 'Resources, not rubbish' picnic day.

With the students, compile a list of things that people usually bring to a picnic, e.g. paper plates, paper napkins, chips, drink bottles. Discuss options that will create less waste. Also consider means of travel that will use the least resources (e.g. walking, bike-riding, car-pooling).

Design and make the picnic invitations for parents/carers and community members (consider email invitations to save paper). Include specific recommendations about what to bring, and how to bring it. Include any community members who helped in students' research.

Set up the picnic ground so that recycling bins (food, paper, aluminium, plastic) are clearly labelled.

Identify student photographers and reporters to document the day in order to create a variety of media texts for the school newsletter, local paper and relevant websites.

Support identified students to prepare speeches and letters to thank community members.

At the end of the picnic, discuss the type of rubbish left and how it could be reduced, re-used or recycled.

Construct a 'Life beyond' mural by sorting 'dry' garbage into different colours and making a collage. The collage could represent the recycling symbol.

Ask each student to select one toy and write an illustrated narrative tracing its life journey from cradle to grave. Read selected stories on the picnic day, using the mural as a backdrop.

Ask student groups to brainstorm, rehearse and perform a comic presentation called 'Ten Tricks with Chopsticks'. The presentation should identify ten innovative and/or humorous ways to re-use wooden chopsticks rather than throw them away.

UNIT 15: SALINE SOLUTIONS

LEARNING AREAS	Science (NSW: Science and Technology), English, Mathematics, The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 3 & 4
UNIT DESCRIPTION	Students learn about the presence of salt in fluids and waterways. They are introduced to the concept of salinity, and appreciate its extent and significance in Australia. In groups, students investigate the causes and impacts of salinity, and the possible solutions. They participate in local salt monitoring and remediation activities, and communicate their understandings in forms that reflect different purposes.
WORD BANK	catchment, conductivity meter, drainage, salinity, water table
RESOURCES	Print Department of Natural Resources and the Environment Victoria (1997) *Saltwatch: A Resource Book for Schools.* Available in PDF from <www.saltwatch.org.au/saltwatch/info_resources.htm>. DNRE Victoria, Melbourne. Department of Natural Resources and the Environment Victoria (2001) *Catchment Education Resource Book.* DNRE Victoria, Melbourne. Videos Land and Water Australia & ABC Education (2002) *The Silent Flood.* Four-part series. ABC TV. Websites www.ea.gov.au/soe/2001/fact-sheets/salinity.html Environment Australia – salinity fact sheet. www.ea.gov.au/soe/index.html State of the environment report for Australia. www.abc.net.au/learn/silentflood/gallery2.htm The Silent Flood image gallery. www.landcareaustralia.com.au Landcare Australia. www.mdbc.gov.au Murray–Darling Basin Commission. Go to Education and view the encyclopaedia index to find information on land and water salinity. www.saltwatch.org.au National Saltwatch – includes dates for annual Saltwatch Week. www.dlwc.nsw.gov.au/care/salinity/index.html NSW Department of Land and Water Conservation – salinity causes, impacts and solutions.

www.nre.vic.gov.au
Victorian Department of Natural Resources and the Environment – Saltwatch for primary schools.

www.sa.waterwatch.org.au/saltwatch.htm
Saltwatch South Australia.

http://audit.ea.gov.au/anra/
Australian Natural Resources Atlas.

www.pictureaustralia.org
Picture Australia – collection of historic photographs housed as part of the National Library of Australia.

Engaging

Set up a salt-detection demonstration – using the tongue as a measuring device! You will need the following resources.

4 clean wine glasses

Solution A – drinking water

Solution B – 3.0 g/L salt (NaCl) (brackish water)

Solution C – 9.0 g/L salt (blood)

Solution D – 35 g/L salt (sea water)

Red food colouring

Popsticks.

Use the following procedure.

Before the demonstration, fill each wine glass (no more than a third full) with a different solution. Place a popstick next to each glass, and set the red food colouring on the table.

Tell the class that you can measure how much salt there is in the water by using a conductivity meter. Say that you do not have a meter, and ask if anyone knows of another way to measure the salt levels. Prompt until someone suggests 'tongue'.

Tell the students that you poured out some solutions into the wine glasses earlier but forgot to label them. One is tap water, one is sea water, one is brackish water. There is also a mystery solution.

Select a volunteer to be your tongue-tester. Ask them to order the glasses from least salty to most salty. They can dip their finger into each glass or use the popstick. Help the volunteer as needed and/or get another volunteer up for a second opinion.

Explain the concentration of salt in each solution. Tell them that it is expected that, in 20 years, the Namoi River (which supplies drinking water for Tamworth) will be way over the acceptable concentration of salt. Note that brackish water is acceptable only for cattle, and that sea water is useful only for mixing cement.

Ask students to guess what fluid might be represented by solution C. Lead them to the answer – blood – and add the red food colouring.

Support the class to develop a joint definition of 'salinity'. Discuss and identify the types of salinity – dryland, irrigation and urban (information at <www.dlwc.nsw.gov.au/care/salinity/index.html> and in other listed resources will support this discussion).

Organise students into three groups. Ask each group to choose either (1) causes, (2) impacts or (3) solutions in relation to salinity. Groups are to construct a mind map that records their thoughts and speculations on the topic. Group discussion might be supported by visual cues from *The Silent Flood* gallery (see website resources). Ask groups to report their discussions back to the whole class.

Inquiring

Explain that salinity presents a major threat to Australian farmlands. Tell students that they will investigate the causes of, impacts of, and solutions to, the problem.

Establish six research groups. Two groups will investigate causes, two impacts, and two solutions. Ask each group to:

- allocate a particular function to each of its members (e.g. a content focus, a role, a responsibility)
- develop a set of inquiry questions, using the earlier mind maps as a starting point. (Support students to devise questions that lead to depth of inquiry, e.g. why, who, what, where questions that do not produce yes/no answers.)

Direct students to appropriate resources (see the unit resource list). Help each student to maintain a reflective journal as they explore the issue.

Encourage the research groups to contact relevant agencies for support in their task. Conduct regular whole-class briefings so that groups do not duplicate contacts – some groups may be able to co-operate by combining their questions and making a single contact.

Acting

Participate in the annual Saltwatch event – an environmental monitoring program that helps communities better understand the salinity problem. During Saltwatch Week, schools and community groups learn about the effects of salinity on water quality in their local catchment by collecting local water samples and testing them with a salinity meter. Participation information is available from Saltwatch (see website resources).

Use the groups who are investigating *solutions* to the problem of salinity as expert advisers to develop a manageable plan for local action by the class. These plans might include:

- planting of deep-rooted trees in appropriate locations on the school site
- assessing a local park on a salinity-prevention scale
- testing the performance of different legumes in the local soil conditions and sharing the results with a local council or farm advisory body.

Communicating

Ask the two research groups who investigated the causes of salinity to join together and develop a diagrammatic *explanation*. The diagram will need textual annotations and must be able to be viewed by a whole-class audience (e.g. projected or posterised).

Ask the two research groups who investigated the impacts of salinity to develop an *information report*. The report will need to include maps and other visual references, and must be able to be shared with audiences outside the school (e.g. published or attached to an email).

Ask the two research groups who investigated solutions to the problem of salinity to present an oral *discussion*. The discussion must include the perspectives of different groups and the pros and cons of potential actions. It should be supported by handouts or *PowerPoint* slides.

Set Saltwatch Week as the deadline for delivery of each form of communication.

Stage a debate: 'The government should fix the problems caused by salinity'.

UNIT 16: EYES IN THE SKY

LEARNING AREAS	Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 3–6
UNIT DESCRIPTION	Through inquiry and experimentation, students understand the science and technology of remote sensing – a valuable tool in managing scarce resources and in offering a new perspective on the environment. They communicate their new understandings through creative expression (e.g. mural and fictitious weather report) and scientific reporting.
WORD BANK	aerial, data, oblique, orthophoto, parallax, photogrammetry, photo mosaic, remote sensing, resolution, satellite, stereo, survey, vertical
RESOURCES	Print A selection of oblique and vertical aerial photographs of the local area. A variety of satellite images showing true colour, false colour and infra-red data. Large-scale topographic maps of the local area. Hann, J (1991) *How Science Works.* Dorling Kindersley, London. Pullan, R (ed.) (1986) *Reader's Digest Guide to the Coast of New South Wales.* Reader's Digest, Sydney. Videos Beyond International (1988) *The Astronaut.* ABC Video. Websites www.ga.gov.au Geoscience Australia. Includes satellite images of Australia. www.asri.org.au Australian Space Research Institute. www.users.bigpond.com/sasmap/page15.html An explanation of photogrammetry. www.thetech.org/exhibits_events/online/satellite Information about satellites and their applications.

Engaging

Introduce the concept of remote sensing by placing a large, multi-coloured object on a chair in the centre of the classroom. Ask various students to describe the object – without naming it – from where they are seated. Note the students' responses on the board. Next, ask the students to lie on the floor. Select different students to describe the appearance of the object. Note their responses on the board. Draw the students' attention to the variety of descriptions and ask them to account for the differences. Explain that an object can have a quite different appearance when viewed from a different angle, in this case an oblique angle.

Ask the students to stand carefully on their desks. Ask them to look down at their feet and describe what they can see on their desks. Ask the students to compare this view with the view when they are sitting down. Explain that the students are now seeing their desks from a vertical position.

Start a word bank with the terms *oblique* and *vertical*. Brainstorm a definition for each term.

Show the students a range of oblique and vertical aerial photography and help them to sort the photographs into each category. Explain that the way in which these photographs were taken means that they could be classified as *remotely sensed data*, and that the interpretation of this form of remotely sensed data is called *photogrammetry*. Brainstorm definitions for the terms – for example, remote sensing is the observation of an object from a distance – and then add them to the students' word bank. Canvass the students to predict how remotely sensed data are collected (most frequently from planes and satellites) and ask them to suggest other ways (e.g. from very high buildings or mountains, high-altitude balloons or kites).

Inquiring

Explain that remote sensing includes both aerial photography and satellite imagery. On the board, compile a list of features that distinguish between the two forms of data collection. The list might include the following differences.

> Satellites orbit around Earth in space, whereas aeroplanes fly within Earth's atmosphere.
>
> Some satellites produce a much higher-resolution image (0.25 metres per pixel) than a standard aerial photograph.
>
> Satellite images can be digitally manipulated to enhance the view by changing the image's colour.

Discuss the uses of remotely sensed data and construct a mind map with the students' suggestions. Write the term 'remote sensing' in the centre of the map, then add their suggestions with connecting arrows. Some uses for remotely sensed data include:

- making and revising maps, especially in inaccessible areas
- surveying soils for agricultural and building suitability
- monitoring different vegetation or crop types and their status
- managing water resources

- managing and assessing forestry areas
- planning urban developments and assessing their impacts
- managing coastal, oceanic and reef systems
- locating mineral resources
- remediating the land after mining operations have ceased
- assessing the impact and extent of natural disasters such as bushfires, floods or volcanic eruptions
- monitoring the weather
- tracking military movements
- spying.

Acting

Set up a simple class experiment to demonstrate the how the concept of *parallax* can be used to determine the height of an object from a *stereo photograph*. Firstly, introduce both terms. Carefully explain the differences between the two concepts, using models and diagrams.

Stereo photographs are produced during parallel sequences of aerial photography. The aircraft photographs the same object during two slightly different flight paths. The resulting photographs overlap at the edges and therefore show two views of objects located at the extremities of the images at slightly different angles. Photogram meters are then able to measure the differences in the angle of the object – its parallax – and calculate its height. To help them do this, they use a pair of stereoscopic glasses.

Give each student a pair of stereo photographs. Ask the students to lay the photographs side by side, flat on the desk in front of them. Ask them to find and identify the same object or feature at the edges of each image. Create individual stereoscopic glasses by showing the students how to hold two magnifying glasses to their eyes approximately four centimetres apart and 30 centimetres above the two photos. Then ask the students to focus on the same object or feature and to rapidly open and close alternating eyes while looking at the object or feature. Students should see a shift in its positioning, demonstrating the concept of parallax.

Encourage the students to bring in recycled materials from home and use them, as a class, to build a model of a satellite. Label the different parts of the satellite and compile a poster showing examples of satellite imagery.

If practicable, conduct an excursion to a museum to find out more about remote sensing.

Communicating

Create a large photo mosaic – a large aerial photograph created when several photographs are joined together – showing the local area. Ask the class to identify significant natural and built features from the mosaic and to research information about each one. Encourage the students to use the information to write extended labels about each feature. Display the labelled photo mosaic in the class under the heading 'An orthophoto of our area' (an orthophoto being an annotated photo mosaic). Add the new terms to their word bank.

Organise small groups to work on oral class presentations featuring remotely sensed data. One group could stage a fictitious weather report based on television reports that use a satellite image to describe the weather conditions. Others could report on a recent bushfire or flood using satellite imagery to show plumes of smoke or the extent of the flooded area.

Help the students to write an illustrated taxonomic information report about the different satellites presently orbiting Earth. Encourage them to include information about:

- the name of the satellite and what it stands for (e.g. Landsat stands for land satellite)
- its launch date (e.g. Landsat 7 was launched on 7 April 1999)
- its life span (e.g. Landsat 7's life span is estimated at 10 years, barring accidents or malfunctions)
- its orbital path (e.g. Landsat 7's orbital path around Earth is from north to south)
- its data-gathering method. For example, two types of sensor systems are used on satellites – 'passive' and 'active' systems. Passive satellites record the amount of electro-magnetic radiation reflected or emitted from Earth's surface. Active satellites bounce a wave of electro-magnetic radiation off the earth and measure the return signal.

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UNIT 17: WHERE DOES YOUR WATER COME FROM?

LEARNING AREAS

Science (NSW: Science and Technology), Studies of Society and Environment (NSW: HSIE), English

UNIT LEVEL

Years 3–6

UNIT DESCRIPTION

Students discuss and explore the critical function of water in the survival and well-being of people and other living things. They identify the hazards of impure drinking water and the characteristics of safe drinking water, along with the types of treatment that water receives before it can be consumed. Through scientific experimentation and study, they investigate the availability of rainwater and the different ways in which it can be collected and presented for consumption.

WORD BANK

aquifer, catchment basin, cholera, finite, gastroenteritis, groundwater, surface water, water-borne

RESOURCES

Print

Barwick, J & J (1998) *Droughts*. From 'Australia's Worst Disasters' series. Heinmann Library, Melbourne.

Burnie, D (1991) *How Nature Works*. Dorling Kindersley, London.

Hathorn, L & Gouldthorpe, P (1995) *The Wonder Thing*. Penguin Books, Melbourne.

Reece, J H (1976) *Lester and Clyde*. Scholastic, Gosford.

Slater, P & Parish, S (1999) *Encyclopedia of Australian Wildlife*. Steve Parish Publishing, Sydney.

Videos

ABC Education. *Waterworks*. Four 30-min. videos: 'The Water Planet', 'Amazing H2O', 'Floating, Sinking and Swimming', 'Taps and Toilets'. ABC, Sydney.

Websites

www.waterwatch.org.au
Waterwatch.

www.streamwatch.org.au
Streamwatch.

www.planetark.org
Planet Ark.

www.epa.nsw.gov.au
NSW Environment Protection Authority. Go to the Resource Centre for teaching resources.

www2.livingthing.net.au
NSW government page. Includes practical water-saving advice.

Engaging

Collect and display a lettuce, a cauliflower and a potato. Name each vegetable and ask the students to guess which contains the most water (the lettuce – 98% water). Discuss the reasons for their choices.

Consider the following questions with the class:

- How much water is contained in a human's body? (Approximately 78%.)
- How much water does a person require each day to survive? (2–5 L.)
- How much water does the average Australian household consume daily? (Approximately 900 L.)

Explain that water is a *finite* resource. Discuss the term and ask the students to suggest other finite resources. Note them on the board, then have the students name where each finite resource is found (for instance, coal is found in the earth's crust, whereas water originates in the earth's atmosphere).

Together, investigate the elements and linkages involved in the water cycle. Model a sequential explanation for the class, pointing out structural and linguistic features.

Inquiring

Identify the characteristics of safe drinking water. Explain that drinking water needs to be quite pure, otherwise it can lead to illness or even death. Identify situations where water is unsafe to drink, and the reasons why it can be dangerous. Together, investigate the variety of water-borne illnesses people can contract, such as cholera and gastroenteritis.

Discuss the processes water goes through to become safe for drinking. Illustrate the following sequence on the board.

> Rain falls onto an area of land known as a catchment basin. Some water seeps into the ground; the rest runs off over the surface of the ground. Often this surface water forms creeks and rivers, which in turn can be dammed to form reservoirs. The water stored in a reservoir is then pumped through filtration tanks to remove impurities such as twigs, weeds and fish. Next, compounds are added to the water to help settle out dirt. Later, fluoride is added to help protect people's teeth. Finally, chlorine is mixed in to help clean and disinfect the water.

Compile a word bank of terms that relate to the supply of drinking water, then divide the students into small groups and ask them to write a sequential explanation outlining the water-treatment process. Have each group read its text to the rest of the class.

Acting

Undertake a class experiment to collect rainwater in a rain gauge over a period of time. Encourage the students to keep daily records of the rainfall amounts. Have them calculate how many days they would need to collect enough water to satisfy one person's daily water requirement.

Conduct a taste test to illustrate the differences between various types of water. First, collect five-litre containers of *four* of the following water types: distilled water, spring water, rainwater, tap water, still mineral water, bore water. Also collect four drinking cups per student. Then follow this procedure.

Label a set of four cups A, B, C and D for each student.

Fill cup A with distilled water, cup B with tap water and so on, until each student has the four types of water. Do not reveal which water type is in each cup.

Note the different types of water on the board, and discuss their various sources.

Draw up a matrix on the board with column headings A, B, C and D and row headings Taste, Smell, Colour and Water type. Have the students copy the matrix into their exercise books.

Ask the students to observe, smell and taste the water in each cup, and to note down their findings in their matrix.

Collate their findings on the board and discuss what led students to their conclusions.

Reveal the correct answers and compare them to those suggested by the students.

Communicating

Encourage each group of students to draw a different part of the water-treatment process, such as collecting water in a reservoir, passing water through filtration tanks, adding fluoride. Then ask each group to nominate one person to come to the front of the class with its drawing. Together, have the class decide the correct sequence of the illustrations. Paste them onto a large piece of card and display them in the class.

Help the students put together a brochure informing the reader about some of the health hazards associated with dirty water. Have them include helpful first-aid tips and information describing how to purify water in an emergency.

UNIT 18: SPLASH!

LEARNING AREAS	Science (NSW: Science and Technology), English, Health and Physical Education (NSW: PDHPE), The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 5 & 6
UNIT DESCRIPTION	Students learn about issues of water quality, including salinity and how it affects living things in the local ecosystem. They appreciate the diverse needs and concerns held by different users of local waterways, and the impact of different human activities on water quality. They conduct first-hand investigations into the quality of a local waterway, and begin to appreciate the relationship between water quality and aquatic ecosystems.
WORD BANK	quality, salinity, turbidity
RESOURCES	Print Wallis, W & Smyth, C (1992) *Ponding: Activities for Your Local Lake, Pond or Puddle*. Gould League of Victoria, Melbourne. Winters, B (1988) *Australian Guide to Pondlife*. Gould League of Victoria, Melbourne. Video Melbourne Water & The Gould League (2002) *The Catchment Challenge*. Part of 'Drains to Our Waterways' kit. Melbourne Water, Melbourne. Websites www.nrm.qld.gov.au Queensland Department of Natural Resources and Mines. Go to Education > Teaching Resources > Primary Modules > Water Cycles and Catchments, and click 'Measuring the Health of a Waterway' in the activities list. Resource Sheets 8–10 support investigations of temperature, turbidity and salinity. www.streamwatch.org.au Streamwatch. www.vic.waterwatch.org.au Waterwatch Victoria. Go to For the Teacher > Waterwatch Manual for a comprehensive community water quality monitoring manual. www.waterwatch.org.au Waterwatch. Go to Who to Contact to identify your local coordinator and obtain information about a LaMotte water-quality monitoring kit or more affordable monitoring options.

Engaging

To introduce this unit, show *The Catchment Challenge* (see video resources). Beforehand, explain that students will be required to take notes in two categories. To facilitate this note-taking, instruct students to fold an A4 page into two sections, unfold the page and into each of the two sections write the headings 'I knew that ...' and 'I found out that ...'. After the viewing, provide time for the class to share and discuss the notes they have taken.

Ask students to brainstorm factors that affect the quality of water in local rivers. Introduce and list any factors that are omitted, such as salinity, pollutants, silt, nutrients and fertilisers. Discuss each item on the list. As a class, decide on the factors that will be investigated in the research component of this unit (be sure to include salinity).

Once research topics have been defined, divide students into small work groups. Ask each group to select a topic and create a set of research questions that will guide its investigation. Provide suggestions about how and where information about the topic might be located.

Locate and collect resources to support students' research. Streamwatch and Waterwatch (see website resources) would make excellent starting points for materials and further contact points. At this time, try to arrange with an 'expert' to accompany the class on a field trip to a local river.

Inquiring

Support the small groups to investigate and answer their research questions with the aim of producing a written and/or visual presentation. Remind students that information will be obtained from a variety of sources, including: guest speakers; direct observation; surveys and sampling undertaken in the field; and written, visual and multimedia texts available in the classroom and library. Groups' purposes and audiences will determine the nature of their presentations.

Invite a number of guests to talk about water quality and management practices. To provide a range of perspectives, guests might include a local council water management officer, a local farmer, representatives of fishing and recreational water users' groups, an industry representative, a representative from the relevant state/territory department, a Waterwatch officer.

Take the class on a field trip to a local river environment. Arrange for an expert who could support students to undertake some water-sampling and survey activities. Have students sample water and test it for temperature, turbidity, salinity and pH. It might also be possible for students to test the dissolved oxygen levels and phosphorus levels as an indication of nutrient run-off. Chart this information.

Back in the classroom, support further research into the impacts on water quality. For example: Are creatures and plants living in or near water affected by quality of water? What happens if the level of salt, dissolved nutrients or chemicals in the water increases? Are some living things more tolerant? Students might undertake some controlled experiments to attempt to answer these questions (e.g. an experiment whereby students grow plants in water containing varying amounts of salt, or students attempt to drink water containing varying amounts of salt).

Acting

Ask students, in small groups, to examine their own lifestyles in light of the work they have undertaken. Ask each group to identify any changes that they could make to maintain or improve the quality of local water. Groups should record these changes as group and individual action plans. Collate groups' ideas. Negotiate a class action plan and an action plan for individuals.

Communicating

Support students to share their research and investigations with the wider community through: articles to the newspaper, articles for school newsletters, posters, descriptive writing, poetry, and expository letters.

Submit the results of water-quality testing to the appropriate database (contact Waterwatch for guidance).

Ask students to prepare letters of appreciation to key participants in the unit.

LEARNING AREAS

Science (NSW: Science and Technology), English, Creative Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 5 & 6

UNIT DESCRIPTION

Focusing on waterways, students explore the concept of interdependence, developing an understanding of cause and effect in environmental terms. They look closely at the impact of human activity on waterways, and develop expertise in a particular issue relating to river health or management. They use a water-bug survey to gauge the health of a local waterway, and report their findings using a range of media and text types.

WORD BANK

interdependence, invertebrate, macroinvertebrate, riparian

RESOURCES

Print

Reece, J H (1976) *Lester and Clyde*. Scholastic, Gosford.

Wallis, W & Smyth, C (1992) *Ponding: Activities for Your Local Lake, Pond or Puddle*. Gould League of Victoria, Melbourne.

Winters, B (1988) *Australian Guide to Pondlife*. Gould League of Victoria, Melbourne.

Websites

www.bugsurvey.nsw.gov.au
NSW government site. Comprehensive and friendly presentation of information about water bug surveying and identification.

www.nrm.qld.gov.au
Queensland Department of Natural Resources and Mines. Go to Education > Teaching Resources > Primary Modules > Water Cycles and Catchments, and click 'Measuring the Health of a Waterway' in the activities list. Resource Sheets 12 and 15 support bug surveying and identification.

www.streamwatch.org.au
Streamwatch. Go to Manuals and Field Guides > Macroinvertebrates in the Electronic Library for help in bug identification.

Engaging

Brainstorm and categorise information under the following headings.

Who uses our local river?

How?

For what purpose?

As a class, use the charted information to create a collage of scenes showing district water use.

Inquiring

As a class, generate a set of questions that focus on the ways the local river or waterway is used. Discuss how these uses might affect the health of the river. Ask students: How can you tell if a river is healthy? What could make a river sick? Do people do things to make rivers sick? Is our river healthy? How can we find out? Who could we ask?

Generate a list of issues to investigate in small groups (e.g. dams and weirs, run-off, droughts and floods, land-use practices, town water consumption, river flow, nutrients, government policies and water regulations). Using the jigsaw strategy, establish 'expert' groups to investigate a topic. Provide groups with a wide range of resources related to each topic, and support each group to use appropriate research skills. On completion of research, groups should give an oral presentation of their findings.

Invite a guest speaker from the relevant state/territory department, Streamwatch, Waterwatch, Landcare or environmental education centre to talk about the local river environment, and related issues and management practices. Provide the speaker with the list of questions generated earlier. Ask the speaker to suggest ways in which the class could undertake some simple water-quality monitoring. Reinforce the understanding that the presence/absence of tiny animals, or 'water bugs', can indicate the health of a waterway.

Acting

Organise an excursion to the local river or waterway for hands-on water-monitoring activities, with a focus on the presence of macroinvertebrates (small, spineless animals). If possible, arrange for an 'expert' to accompany the trip. Contact the local environmental education centre for support and resources. At this site, support students to collect and identify water bugs. In the field or back in the classroom, ask students to draw and label the bugs observed.

As a class, collate and analyse the results of water monitoring. Discuss the findings. Ask: Do the results support your earlier research? What will we do with the information that we have? How will we tell the local community about our findings? Why might it be important to do this?

Communicating

As a class, consider and list a number of ways in which the students could communicate their findings to the wider community. Divide the class into small groups and allocate each group a particular communication project. These projects might involve groups:

- writing information reports
- producing an exposition to send to a local newspaper or radio station
- contacting the local TV station to call a press conference
- creating a range of posters that can be displayed in shops, council chambers, art galleries, libraries or tourist outlets
- designing and launching a brochure to inform the local community.

LEARNING AREAS	Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 5 & 6
UNIT DESCRIPTION	Students consider the important water features in their local area, then set these in the context of their catchment. Students predict the likely activities of the body that manages their catchment, and then research some of these activities in depth. Using these management activities as a stimulus, students design smaller-scale activities that they could carry out themselves. Using visual and written texts, students communicate the purpose, nature and findings of their activities. These texts are bound into a whole-class document that is sent to the local catchment authority.
WORD BANK	acid, alkaline, authority, biodiversity, catchment, litmus paper, turbidity
RESOURCES	Print

Burnie, D (1991) *How Nature Works*. Dorling Kindersley, London.

Hann, J (1991) *How Science Works*. Dorling Kindersley, London.

Hathorn, L & Gouldthorpe, P (1995) *The Wonder Thing*. Penguin Books, Melbourne.

Murray–Darling Basin Commission (2002) *Murray–Darling Basin Initiative* and *Environmental Challenges in the Murray–Darling Basin*. Brochures. Bookmarks also available. MDBC, Canberra.

Murray–Darling Basin Commission. 'Basin Salinity Management Strategy', 'River Murray System', 'The Murray–Darling Basin Information Poster', 'Towards Sustainable Rivers', 'Welcome to the Murray–Darling Basin'. Posters. MDBC, Canberra.

Videos

Murray–Darling Basin Commission (1994) Murray–Darling 'Snapshots' 1, 2 & 3. MDBC, Canberra.

Murray–Darling Basin Commission. *Blooming Algae; Irrigation; Links with the Land; Salt; Water: Inland Rivers – Lifelines or Polluted Pools?*. MDBC, Canberra.

Websites

www.mdbc.gov.au
Murray–Darling Basin Commission.

www.rbms.com.au
River Basin Management Society.

www.rivers.gov.au
River Landscapes. Go to River Management Issues for fact sheets with relevant background information.

www.streamwatch.org.au
Streamwatch.

www.waterwatch.org.au
Waterwatch.

Engaging

Read *The Wonder Thing* with the students. Ask them to guess what the wonder thing is before they get to the end of the book.

Encourage students to recount any memorable experiences they have had with water. Facilitate a class discussion regarding the importance of water. Ask the students to discuss the following questions: 'Where does water come from?'; 'In what ways do we use water?'; 'Why is water important to us?' Draw a table on the board and use the questions as column headings. Note down the students' responses in each column.

Divide the students into three groups and assign a category from the above discussion to each group. Ask each student to choose a response from his or her allotted category, write it on a sheet of paper and illustrate it. Display the finished products around the classroom.

Draw a large-scale map of the local district and pin it up. Point out the important natural features (especially bodies of water such as creeks, lakes and rivers) and built features of the area. Help the students to locate where they live and pin flags on the map to show their homes.

Explain that students' local district is part of a much larger area called a water catchment area. Define the term 'water catchment area' and help students to identify the water catchment within which they live. Ask the students to identify the major rivers within your catchment, and explain that much of the rainwater that falls in their district eventually drains off through one of these rivers into the sea.

Inquiring

Divide the students into groups and encourage them to predict the kinds of things that the catchment management authority would be involved in, such as measuring water flow, maintaining water-quality standards, monitoring agricultural usage of water, supervising recreational usage of waterways, monitoring environmental issues including salinity levels, fish stocks and blue-green algal blooms. Represent the students' predictions on the board as a mind map.

With input from the students, choose four or five of their predictions to research in more depth. Divide the students into groups and allocate one prediction per group. Encourage the students to use a variety of primary and secondary resources such as scientific experts, books, videos, CD-ROMs and websites to discover more about their topic. Ask each group to share their findings with the rest of the class.

Acting

Help each group to design a hands-on activity that they could undertake at a local waterway. Ensure that the activity relates to the group's chosen study topic. Possible activities include:

- surveying the recreational or commercial use of the waterway to determine the types of activities that take place there, and their environmental impacts
- monitoring the pH (acidity/alkalinity) of the water (pH can be tested with litmus paper. If the paper turns red, the water is acidic. If it turns blue, the water is alkaline. The more extreme the colour change, the more extreme the acidity or alkalinity; both extremes affect the biodiversity of the waterway.)
- sampling and identifying the diversity of the local flora, such as the aquatic plants or the plants adjacent to the waterway
- sampling and identifying the diversity of the local fauna in and around the waterway
- assessing the turbidity of the water at various locations to measure, roughly, the oxygen content. (The more turbid the water, the less oxygenated it is, and the less able it is to support life.) Students could bring back samples to class and filter them through a home-made filter. (A water filter is easily made by using a recycled PET bottle with holes punched in the bottom filled with alternating layers of cloth, sand, charcoal and gravel.)

Take students on an excursion to the local waterway, at which they can implement their chosen activity.

Communicating

Guide the students in each group to hand-write or desktop-publish their practical activities using a variety of text types such as experimental procedures, illustrated information reports, recounts and explanations. Suggest that their results could be presented using a variety of means including graphs, tally charts and completed questionnaires.

Send a bound publication of the students' findings to the local catchment authority with a covering letter that has been jointly constructed by the class. The letter should contextualise their work and present their findings and concerns about environmental issues pertaining to their local waterway.

Display a copy of the students' work in the school library or foyer.

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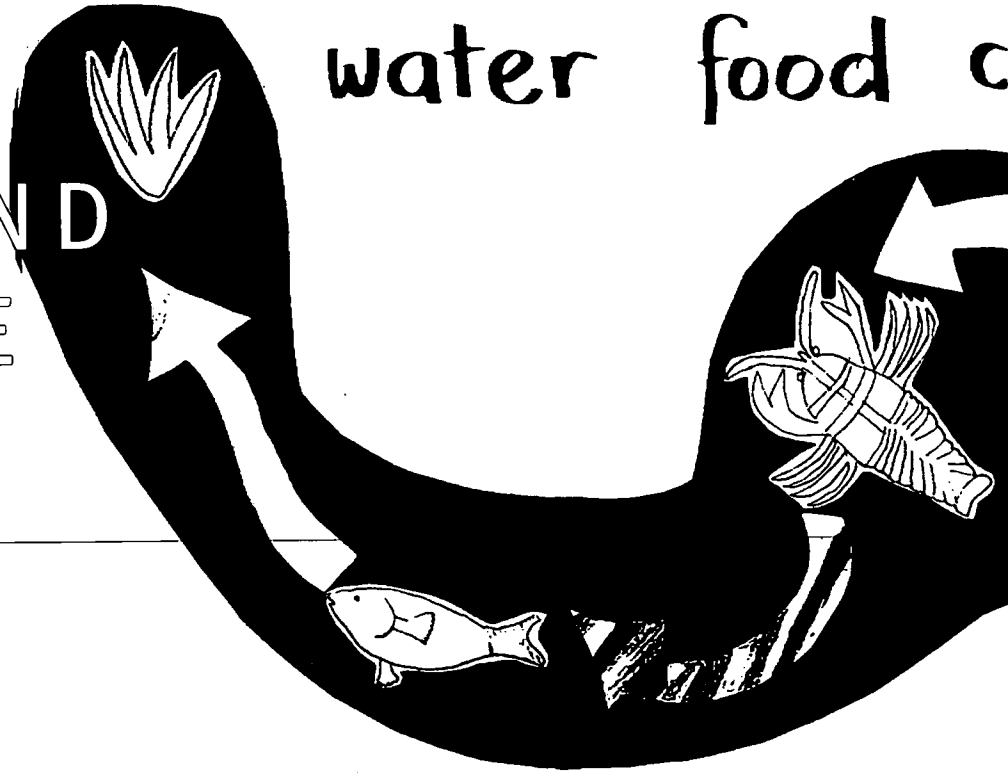
Unit 21: Message to the Future
Unit 22: About Town
Unit 23: Inventive Aussies
Unit 24: Down by the River
Unit 25: Cruisin' Down the River
Unit 26: Changing Landscapes
Unit 27: Know Your Neighbours
Unit 28: Heritage Trail
Unit 29: Biodiversity
Unit 30: Agenda 21

TIME AND CHANGE



UNIT 21: MESSAGE TO THE FUTURE

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 1 & 2

UNIT DESCRIPTION

Students compare the past and present lives of Indigenous and non-Indigenous Australians, considering a range of cultural artefacts. This leads to discussion about historical evidence – the things that tell us how people once lived. Using a range of communication tools and text types, students prepare their own 'historical evidence' in the form of a time capsule to be opened in the future.

WORD BANK

evidence, Indigenous, occupation, traditional

RESOURCES

Print

Hashmi, K & Marshall, F (1998) *You and Me, Murrawee*. Penguin Books, Melbourne.

Lawson, H (1974) *The Drover's Wife and Other Stories*. First published 1892. Hodder & Stoughton, Sydney.

Videos

Film Australia (2000) *Federation*. Three-part video, 170 mins. ABC Video.

Clip of a current Australian soap opera.

Websites

www.abc.net.au
ABC online.

http://pandora.nla.gov.au/pan/10492/20021115/index.htm
Web archive of the National Council for the Centenary of Federation site.

www.naa.gov.au/education/education.html
Classroom ideas and resources from the National Archives of Australia.

Engaging

Read the story of *You and Me, Murrawee* with the class (see print resources). Guide a discussion regarding the similarities and differences between the activities and cultural backgrounds of the two main characters. Before reading the last page, ask the class to decide if the two girls are living in the same time period. Tally their responses and invite the students to explain their decisions. Read the last page together and revisit the hints in the text that set the characters in different temporal locations.

Encourage the students to participate in a discussion about the traditional life of Aboriginal people who lived in their local district. Initiate the discussion by relating a Dreaming story from a local Aboriginal language group. Focus the broader discussion by asking such questions as: "Where did Aboriginal people live?"; "How did Aboriginal people get food?"; "What kinds of tools did Aboriginal people use?".

Read a selected passage from *The Drover's Wife* to deepen students' understanding of the perils and feelings of isolation experienced by early European occupants in the Australian outback. Have the students contribute to a discussion about the daily lives of the first newcomers to their local area. Focus the discussion using questions similar to the ones used before.

Show a video clip of a popular Australian soap opera such as *Neighbours* or *Home and Away*. Establish whether the students think these programs are a true reflection of modern Australian life. Then, discuss what they think characterises the lifestyles of modern Australians. Have the students compare and contrast the lifestyles of modern Australians (including Aboriginal people) with those of early European occupants and of Aboriginal people prior to European occupation.

Inquiring

Display several everyday objects (or pictures of objects) that were used to perform similar tasks by traditional Aboriginal people and early European occupants, such as: coolamon and cradle, dilly bag and canvas bag, digging stick and hoe, hunting boomerang and gun, stone axe and hatchet, ochres and paints. Invite the class to examine the objects and to suggest how they were used. Ask the students to match the two sets of items and to draw, bring in or describe a modern equivalent. Record the students' responses on a wall chart.

Use the completed wall chart to initiate a discussion about the significance of physical evidence when reconstructing social histories of groups of people. Ask the students to think about what we know about the past and how we know about it. Pose the question: "How will people in the future know how we lived?". Brainstorm a list of possible sources of evidence that may reveal our lifestyle to future generations.

Introduce the concept of a class 'time capsule' to be opened on a future date that is significant to the school or local area. Discuss what material the container should be made from to ensure its longevity, and the requirements and possible locations for its storage. Brainstorm the possible contents of the capsule. Discuss a strategy for recording the site of the capsule, and for triggering its re-opening.

Acting

Organise a visit to the local library to locate historical information about the local area.

Take the class on a walk around the local area to collect specimens, take photographs or make sketches.

Help the students to conduct surveys, questionnaires or taped interviews with local residents at the shopping centre.

Visit the local media offices (newspaper, radio or television) or council for sources of information.

Invite a significant local person (Aboriginal elder, government officer or community worker) to come and talk to the class about their life experiences.

Communicating

Jointly construct a time capsule. Suggested elements include:

- a current class photograph of the students, showing their names
- personal fact files compiled by each student, detailing their thoughts on living in the district
- an annotated map of the local area showing the locations of the students' homes and school
- photographs, video clips, drawings or sketches of the local area showing both built and natural features of the local environment
- copies of taped conversations with local dignitaries or residents describing their role in the local district or relating stories of local significance
- responses from questionnaires or surveys of the local populous
- a current calendar detailing local events or important school events
- a current copy of the local newspaper or other significant community publication
- a videotape of a current local news broadcast
- an audiotape of a local agricultural or community radio broadcast
- information leaflets and brochures from local businesses and community groups detailing their products or involvement in the community
- a book containing pressed specimens or photographs of important local flora, either native or agricultural. Include an information report on each specimen and an explanation of its significance
- a file containing photographs, illustrations and information about significant local wildlife or agricultural animals.

UNIT 22: ABOUT TOWN

LEARNING AREAS	English, Studies of Society and Environment (NSW: HSIE), The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 1 & 2
UNIT DESCRIPTION	Students develop an understanding of the changes that have taken place in the local community over time through observation, discussion and research. As emergent historians, they appreciate the significance of older people and of heritage buildings as information sources. They use listening and speaking skills to research the past, and they create recounts, information reports, visual art representations and a neighbourhood 'history walk' to share their understandings.
WORD BANK	document, heritage, history, map, memory, oral history
RESOURCES	Print Local area street map. Wheatley, N & Rawlins, D (1987) *My Place*. HarperCollins, Melbourne. Websites www.archivists.org.au/directory/asa_dir.htm Directory of Archives in Australia – comprehensive guide to archive collections and resources.

Engaging

Escort the students on a walk into town or to the neighbourhood centre. Ask them to tell a partner all the stories they know about the places they visit.

In the classroom, ask the students to draw a map of the area you covered on the walk, highlighting the important places. During this activity, ask students to consider: Why are these places significant? Are they significant to everyone in the community? Why? Do you think that the significance of any place might have changed over time? Why?

Display the maps and invite members of the local community who have a connection to particular places to visit the classroom and talk to the students about why these places are important, and how and why these places have changed over time. Try to include a balance of speakers about old and new places so that students develop a sense of the changing nature of the local natural and cultural environment.

Discuss the places that would be of local significance to people who live in the area and those who might visit. These places will include buildings, cultural sites and natural features. Draw out what is meant by a 'significant place', and the reasons particular places might be considered significant and others not. Ensure that the places listed recognise diverse cultural/ subcultural groups and include sites of importance to the local Aboriginal community.

Obtain a basic town map. Have students locate and mark the places listed. Display the map in a prominent place, and continue to add places during the course of the unit. Use a different-coloured marker for subsequent additions so that it is possible to recognise the students' developing knowledge of the local area.

Inquiring

Create a class list of significant places in the local community that students would like to find out more about. Have students work in groups to create a list of questions that they would like answered. Ask each group to share its questions with the rest of the class to receive suggestions about how the group might proceed to answer these questions.

Review the research methods suggested. Ensure that students consider interviewing particular community members, visiting the local museum, searching the Web, visiting the library, locating information from the archives of the local newspaper or historical society, writing to a local council heritage officer, visiting the place to be researched.

Acting

Invite parents and carers to take a 'history walk', with the students acting as their tour guides. Explain to the class that tour guides such as museum education officers and national park interpreters are very knowledgeable about their museum/park yet are interested to listen and learn from their visitors. Encourage your junior guides to display their knowledge of the area but also to listen to the experiences of those on the tour.

Seek out opportunities to involve students in acting to preserve a school location that is important to them – for example, identifying an important monument or area of the playground and planning the best way to conserve and maintain it.

Involve students in a local community project to save or rehabilitate a significant historical, cultural or environmental site. Make contact with local bush-regeneration, historical society, Landcare or Waterwatch groups for suggestions.

Communicating

Have student pairs write an information report based on their research into a significant local place. Students should include their map with annotated descriptions. Where possible, students should be supported to include facsimiles of pictorial and photographic information located.

Support students to draft, edit and desktop-publish their history walk as a DL-sized brochure (an A4 sheet folded twice).

Guide class members to recount the town walk orally. Be sure to model each stage of a recount. Then ask students to write a personal recount of their town walk independently, drawing on word banks for appropriate names and spelling.

Have students first create a black-and-white representation of the place researched as it would have looked long ago, then create a coloured representation of the place as it appears today. Pen and ink, collage, paint or pastel could be used.

Publish and display students' work in the classroom or another local public space. Have students design and prepare a written invitation for families, local community leaders and all people who have provided research support.

UNIT 23: INVENTIVE AUSSIES

LEARNING AREAS	Technology, Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 1 & 2
UNIT DESCRIPTION	Students uncover the 'clever' Australians who have invented and made things that we use every day. In the process, they make links between technology and the socio-cultural environment. They demonstrate their understanding of the design process by making an 'inventors' board game and planning their first invention.
WORD BANK	agriculture, design, innovation, invention, inventor, medicine, patent, recreation, technology
RESOURCES	Print

Gott, R (1996) *Australia's Best Inventors.* Cardigan Street Publishers, Melbourne.

Kruszelnicki, K (Various) Series of books including: *Great Australian Facts and Firsts; Ears, Gears and Gadgets; Flight, Food and Thingummygigs*; *Forest, Fleece and Prickly Pears.* HarperCollins, Melbourne.

Port, L & Murray, B (1978) *Australian Inventors.* Cassell Australia, Melbourne.

Renew, R (1993) *Making It: Innovation and Success in Australia's Industries.* Powerhouse Publishing, Sydney.

Websites

www.innovated.gov.au
Educational resources from IP Australia in support of innovation and creativity.

www.ippyonline.gov.au/about/default.asp
Information about intellectual property – designs, patents, trademarks and copyright.

www.inventorsmuseum.com
The Inventors Museum – an online museum from the US.

www.phm.gov.au
Powerhouse Museum site, including Australia Innovates and Behind the Scenes.

www.amol.org.au
Australian Museums and Galleries Online. Go to Discovernet for learning support resources.

Engaging

Bring in a Granny Smith apple and pictures showing a rotary clothes hoist and a milking machine. Pass the items around the class, then ask the students to guess what the items have in common. Use the information below to explain that an Australian invented each item, and that each is now used worldwide.

> Maria Ann Smith accidentally invented the 'Granny Smith' apple during the mid 1800s on her 100-acre farm in Ryde, New South Wales. It was commercialised by apple-growers in the Bathurst and Orange regions at the beginning of the twentieth century.
>
> The rotary clothes hoist was invented by Lance Hill in the mid 1940s after his wife complained that she was unable to dry clothes on the straight line in their backyard because it was too low. Lance used a crown and pinion system to wind a metal clothesline frame up and down to reach the breeze. His neighbours were so impressed with 'Hill's Hoist' that Lance was producing it commercially within one year.
>
> John Hart and David Robinson invented the first milking machine late in the nineteenth century. It consisted of four cups that were placed over a cow's teats. A pulsating vacuum extracted the milk. All other milking machines have adapted these operational principles.

Inquiring

Discuss the meanings of 'invention' and 'inventor'. Encourage the students to use a dictionary to look up the meaning of the words and then construct a definition for each one. Explain that often when someone invents something, they take out a patent on their invention. Ask the students to predict what a patent is and what use patents have.

Write or draw a range of Australian inventions on the board (see below for some suggestions). Discuss what the different inventions are used for, then place each into a category according to its use, e.g. medicine, agriculture, recreation, defence. Finally, guide the students in sequencing the inventions from oldest to most recent.

Include space for an illustration of the invention. Allocate small groups of students one or two of the inventions. Help them to use the Internet or school library to locate further information.

> Some Australian inventions
>
> bionic ear, cane harvester, cattle-tick vaccine, feature film, furrow stump-jump plough, mechanised shears, Merino sheep, polymer banknote, Speedos, torpedo, utility vehicle

Brainstorm the types of information students could find out about the inventions. Compile a template sheet with spaces on it so students can record:

- the name of the invention and inventor
- the date it was invented
- how it was/is used.

Once the students have completed their research, collate the dates when the items were invented and recheck the original time sequence. Discuss the similarities and differences between their 'guestimate' and the accurate time sequence.

Encourage the class to think about how people lived and worked before these inventions were developed. Was their daily life and work more difficult? What did they use instead of the inventions? How have the inventions affected the way people go about their business? How have the inventions changed our natural environment? Encourage the students to talk with older relatives and friends to find out what people's lives were like before some of these inventions were developed.

Contact the CSIRO or a museum (such as the Powerhouse Museum in Sydney) to find out what recent agricultural inventions are being researched and developed, such as sheep-shearing robots or biological wool-harvesting (where a sheep is genetically engineered to shed its wool at a certain time). Discuss the advantages and disadvantages of these types of inventions. Support the students to recognise that inventions are not just things; they may also involve techniques, processes and systems.

Acting

Go to a farm to watch cows being milked or to examine a range of agricultural machinery such as a shearing machine, wool press, chaff cutter, drill cultivator, rotary hoe, sunshine harvester, stripper harvester or header harvester. Work with the students to formulate some questions to ask the farmer about the equipment before they go.

Encourage the students to formulate their own invention. It could relate to their home, pet or school. Ask the students to draft it on a large sheet of paper or using computer drawing software. Have the students explain how it works to the rest of the class. If possible, have the students create a prototype of their invention using recycled materials. Display the inventions, with accompanying notes about their use and workings, in the school's foyer.

Communicating

Encourage student pairs to write a short information report about the Australian inventions they researched. Collate their texts into a desktop-published booklet or display them around the class.

Create a 'Technology timeline' display of items or photographs that were invented by Australians, with information about each one.

Have students tell a story starting with "When I am an inventor I will make a ...".

As a class, design and make a board game about Australian inventors and inventions called 'Bright Sparks'. Base it on a popular board game that students are familiar with (such as Snakes and Ladders) and include:

- cut-outs of various inventions as counters
- positive or negative effects of each invention (such as 'Milking machine shortens milking time, go forward four spaces' or 'No petrol for ute, go back two spaces').

UNIT 24: DOWN BY THE RIVER

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), English, Science (NSW: Science and Technology), The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 3 & 4

UNIT DESCRIPTION

Students develop knowledge of their local river environment and its significance to individuals, groups and the wider community. They develop an understanding of the range of ways that the river environment is used and cared for by members of their community. They set and pursue research questions that build on their individual interactions with the river. In the process, they learn how they can better contribute to river health.

WORD BANK

management, water quality

RESOURCES

Print

Base, G (2001) *The Waterhole*. Viking, Melbourne.

Hashmi, K (1999) *You and Me, Murrawee*. Viking, Melbourne.

Websites

www.ea.gov.au/education/teachers/
Environment Australia.

www.riverhealth.com
Information about international and regional river health conferences.

www.ea.gov.au/water/rivers/nrhp/
Objectives of the National River Health Program.

www.waterwatch.org.au
Waterwatch.

Engaging

As a class, brainstorm and record all that students know about rivers in their local area, including the ways in which they are used and cared for by groups in their community. This will help determine students' prior knowledge of local rivers and environments. Once this information has been recorded, work with students to categorise it – for example, names of rivers, uses of rivers, flora and fauna associated with rivers, environmental issues or concerns etc.

Invite speakers with a connection to local waterways to talk about: how they use the river; what they have observed about water quality; and ways that they attempt to ensure the continued health of the river environment. Speakers might include recreational and industry users such as local boating and fishing associations, rowers, regatta or festival organisers, local tourism operators, farmers etc.

Read *The Waterhole* and/or *You and Me, Murrawee*. Ask students to speculate about wildlife and family life by the river 250 years ago.

Ask students to write or represent their own personal connections to local rivers, and the ways in which they use and care for them. Provide an opportunity for each student to present this work to the class. After each presentation, have students ask the presenter a series of questions about the presentation. These questions – and others developed by each student – will form the basis of later individual research. The intention is for each student to become more informed about the ways in which they can personally support the management of river environments through their own interactions with them. This might be in relation to fishing, water use in the home or school, boating, swimming etc.

Inquiring

Explain that each student will be required to investigate and answer the questions posed, then produce a written and/or visual presentation of their findings. The presentations will be used in a class display that will be open to the school and other interested individuals and groups.

Have students refine the list of questions from the previous activity into a set of key research questions. Ensure that these questions are sufficiently focused and able to answered within the time available.

Support students to create a list of contacts and resources that they will use for their research. They may need to write letters or emails, make telephone calls and/or send facsimiles to particular groups. Gather a range of relevant resources and contact points from the local library, school library and Internet.

Contact a local river or water 'expert' to come and talk about environmental issues related to local waterways. Provide the speaker with the information gained in the previous activity so that they are aware of the students' topic knowledge and the ways in which they interact with the river. The local Waterwatch officer would be an excellent contact for this talk and for future activities.

Support students' development of field knowledge by working to develop lists of key words associated with research topics. Display these words and their meanings prominently in the class and create activity sheets, computer crosswords and word searches for students to reinforce this developing vocabulary.

Acting

Encourage students to transfer their research knowledge into action. Organise group role-plays in which students discuss, then enact, some of the actions that they will take. Students could explore a range of potential actions by taking on roles such as: scientist, journalist, environmental campaigner, fisher, farm industry adviser. Alternatively, students could focus on one objective of the National River Health Program (see website resources).

Organise to take students on a riverside picnic. This will provide an excellent opportunity for field investigations. If possible, arrange for the Waterwatch officer or similar expert to accompany the class to undertake a number of tests for water quality. The sensory experience offered will also provide an excellent stimulus for writing on location or back in class.

Communicating

Support students to consider the full range of literary, factual and visual texts available to them to communicate the outcomes of their research.

A *narrative* could tell the story of a particular individual's interaction with a river, and how they came to (or encouraged others to) be more sensitive in their use of the river environment.

An *explanation* could be used to explain the processes that they will undertake to interact with the river environment in a more sensitive way in response to their research. The explanation might even provide detail about the interrelationships between different species within a natural environment.

An *information report* might be used to outline certain types of interactions with the river environment – including when, where, why and by whom – and then describe the kinds of things that happen within these interactions.

A combination of *description* and *explanation* could be used when reporting upon how and why particular forms of interaction with the river environment have changed over time.

A *recount* could set out the way in which the student interacts with the river. A recount could also be used to document an excursion or field trip to a river environment; this could include photos of the students, the places visited, and a few older photos of the place visited to show any changes.

If students' research has involved data-sampling and surveying, it might be appropriate for them to record this information in the form of a graph and/or a table.

Photographs, drawings and paintings might also be used to present information visually.

Create a class display of students' work in a school or public space. Invite other classes, families, interested local leaders and people who have supported student research to view this exhibition.

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 3 & 4

UNIT DESCRIPTION

The forgotten trade routes of inland Australia are brought back to life in this unit, where students investigate river transport in colonial and modern times. They view or reconstruct river craft used in the past and appreciate the appropriate use of technology practised by Aboriginal people living on or near rivers. Using a range of media and text types to communicate their understanding of the purposes and events related to river transport, students are invited to bring the spirit of the regatta right into their playground.

WORD BANK

boat, chart, dinghy, dory, ferry, knots, regatta, riverine, sailing boat, skiff, tide

RESOURCES

Print

Holiday brochures showing pictures or photographs of rivers (try to find some showing tourist river craft such as pleasure boats or paddle steamers).

Historical photographs of river craft being used as methods of transportation on Australian river systems such as the Murray–Darling.

Eastburn, D & students of Euston PS. 'Paddle Steamers in the Murray–Darling Basin'. Board game including *Inland Shipping* poster. Murray–Darling Basin Commission, Canberra.

Murray–Darling Basin Commission. *Murray–Darling Basin Map* and *The Murray–Darling Basin 1902*. Posters. MDBC, Canberra.

Murray–Darling Basin Commission. *River Murray Navigation*. Information sheet. MDBC, Canberra.

Twain, M (1995) *The Adventures of Huckleberry Finn*. First published 1884. Oxford University Press, UK.

Websites

www.mdbc.gov.au
Murray–Darling Basin Commission.

www.abc.net.au
ABC online.

http://maritime.heritage.nsw.gov.au
Maritime heritage online.

www.murray-river.net
The Murray River.

BEST COPY AVAILABLE

Engaging

Ask the students to bring in some holiday brochures that show images of rivers. Ask the students to describe how they feel when they look at the images. List their responses on the board. Next, ask the students to recount an experience they have had at or on a river. Who were they with? What were they doing? What kinds of river craft did they see? Note their responses.

Ask the students if they can name some major rivers in Australia. Give the students a photocopied map of Australia and guide them in highlighting the rivers they have named. Draw attention to the major rivers near them. Explain the importance of these rivers to Australia.

Inquiring

Show the students black-and-white photographs of past river craft that have plied Australian rivers. Discuss the types of craft shown and encourage the class to predict what they carried or were used for. Read a couple of passages from *Huckleberry Finn*, by Mark Twain, describing Finn's experiences of paddle boats on the Mississippi. Invite the students to imagine what it would have been like living and working on rivers 100 years ago. What sorts of people would have worked on or near the river? What sorts of jobs would they have done? Jot their responses on the board and compare them with the previous sets of responses.

Divide the class into research groups and ask them to choose one sort of boat that has been used on Australian rivers. Ensure that some groups research information about past modes of transportation while others research modern modes. Then, together, construct a transport fact file template that students can use to guide their research. After groups complete the research, convene a class conference and discuss how the different forms of transportation have changed over time, and the ways in which river usage has altered.

Acting

On the water

Lead an excursion to a nearby waterway or museum featuring water craft. If possible, experience life on the river by catching a ferry, taking a boat ride or attending a festival or celebration. Contact the organising body to find out how your class could participate in the event.

Indigenous technology

View (online) or visit Aboriginal fish traps. The traps demonstrate the development of highly skilled fishing techniques involving a thorough understanding of engineering works (dry stone walls), river hydrology and fish biology. Fish traps are found in many forms, but can include a complex arrangement of stone walls several hundred of metres in length, commonly built in shallow-water areas like tidal lakes and rivers on reef.

Communicating

Construct an illustrated water-transport timeline as a classroom frieze or create a desktop-published document using information and illustrations derived from the students' transport fact files.

Create a class mural showing two river scenes. One scene could depict events of 100 years ago, while the other might show events of today. Encourage the students to discuss the content of each scene and then to provide the illustrative elements, using a combination of media. Annotate the murals with short descriptive or explanatory passages.

Encourage the students to write an imaginative procedural recount of a day in the life of a riverboat captain from 100 years ago. Ask them to read their compositions aloud to the rest of the class. Repeat the exercise, this time focusing on the life of a modern riverboat captain. Discuss the similarities and differences between the two scenarios.

Stage your own narrated and costumed 'flotilla' event in the playground or as an assembly item. Ask students to design a poster or brochure advertising the event and inviting parents, carers and community members to their 'riverboat cruise'. Ensure that students include information about the dates and times of the cruise, the range of activities offered to passengers and the costs of the trip.

UNIT 26: CHANGING LANDSCAPES

LEARNING AREAS	Science (NSW: Science and Technology), Studies of Society and Environment (NSW: HSIE), English
UNIT LEVEL	Years 3 & 4
UNIT DESCRIPTION	Students act as 'junior geographers' as they explore the effect of natural processes and human interventions on the landscape and its various landforms. They identify the rates of change associated with natural events. They explore traditional and newer land-management practices, considering their benefits and costs, and identifying sites of innovation. They communicate the impacts of change in newspaper reports and fictionalised accounts.
WORD BANK	agriculture, conventional, landform, landscape, permaculture, traditional
RESOURCES	Print Barwick, J & J (1998) *Droughts*. From 'Australia's Worst Disasters' series. Heinemann Library, Melbourne. Burnie, D (1991) *How Nature Works*. Dorling Kindersley, London. Nicholson, J (1997) *A Home among the Gum Trees*. Allen & Unwin, Sydney. Websites www.abc.net.au/rural/ An overview of all current rural issues. www.abc.net.au/landline/ Rural affairs TV program. www.landcare.gov.au Landcare.

Engaging

Brainstorm a definition for the term *landscape*. Compile a list of different types of landscapes, and discuss their features. For example, plains are usually areas of flat land. Encourage the students to bring in pictures from travel brochures to illustrate the listed landscapes.

Talk about the local landscape and discuss the different land*forms* within it. Display a simplified map showing the physical aspects of the local area. Point out the different landforms and the symbols used to describe them. Establish the concept of landform change by showing the students before-and-after images of landscapes that have been affected by catastrophic natural events (e.g. fires started by lightning strikes or floods caused by excessive rain). Discuss the effects of such events on the environment's flora, fauna and overall shape, and encourage the students to predict what the area could look like one, ten and twenty years after the event.

Explain that natural changes to landscapes also happen very slowly, over long periods. Brainstorm various sorts of physical processes that change landscapes slowly. For example, discuss the impact of rain, sun and wind on different rock types, or view maps or images of river courses that have slowly altered over time.

Ask the students to identify how humans have changed landscapes. Enlarge and display a map of the local area. Together, identify and label all the major human-made features such as roads, dams, buildings, farms, parks and reserves. Discuss the impact of these features on the landscape. Explain that people have significantly altered environments in order to fulfil a variety of needs. Establish the different types of needs that people have, such as the need for food, water, shelter and access. Explore how people have fulfilled such needs both in the past and present, and how they could be fulfilled in the future.

Inquiring

The changing landscape

Tell students that they are going to do group research into changes to the landscape. Brainstorm the range of information they could use, and where they could locate it.

Show examples of the different forms in which research findings can be presented, such as a 'flick' book, a poster, a computer slide show, digital or dramatic animation.

Introduce and/or clarify any relevant terms or concepts.

Divide the class into three large groups and allocate each group one of the numbered investigations below. Then split the larger groups into small groups and encourage each small group to choose a subset of each research task.

1. Investigate Indigenous Australians' interactions with the natural environment.

   Compare locally available bush foods and medicines used by Indigenous communities in the past with those available today.

   Compile an overview of Indigenous food-cultivation practices such as firestick farming or the use of fish traps. Consider their beneficial and detrimental effects. (For example, firestick farming helped to burn the land clear of vegetation, providing nutrients for the soil and reducing the severity of naturally occurring bushfires. It also altered the ecological balance of areas and contributed to the spread of rangelands.)

   Investigate the impact of Indigenous belief systems on the use of the land. (For example, if a community had a totem represented by a particular animal, its members did not eat that animal; similarly, certain plants and animals were only harvested at prescribed times.)

   Identify and learn traditional stories about how landscapes have formed and changed.

2. Investigate non-Indigenous Australians' interactions with the natural environment, focusing on farming practices.

   Explore diverse cultures' belief systems and the ways in which they have contributed to farming practices in Australia. (For example, the first attempts at growing crops in Australia failed because British occupants expected growing conditions in the new environments to be the same as those in Britain.)

   Compile an overview of the impact of introduced hard-hoofed animals such as cattle and sheep on the local landscape.

   Compare the impact of different types of farming practices on the landscape. Include intensive farming (e.g. market-gardening, cattle feedlots or pig/poultry farming) and extensive farming (e.g. arable monoagriculture, cattle or sheep stations) practices.

   Assess the impact of fertilisers and insecticides on ecosystems and the wider environment.

3. Investigate farming methods that may be used in the future.

   Compile an overview of changing attitudes towards farming practices.

   Examine the similarities and differences between conventional farming practices and those of permaculture or organic farming.

   Assess the costs and benefits of remediating landscapes, including reforestation, establishment of biotic sanctuaries and productive use of saline land.

Acting

Lead an excursion to a local lookout and encourage the students to observe the surrounding landscape. Discuss the prominent features. Help the students to categorise them into natural and built features. Encourage the students to draw a labelled sketch of the view or to take some photographs.

Using local maps, images and the students' photographs or sketches as sources of information, help small groups of students to build papier-mache models of the local landscape. Label all the natural and built features shown on the models and display them in the classroom.

Visit a local farm to find out how the farmer has varied her or his agricultural practices to accommodate the natural features of the landscape. Encourage the students to ask questions to find out if the farmer's practices have changed over time.

Communicating

The Daily Planet

Use students' research information to compile a local newspaper. Help the students to write several newspaper articles describing periods of change to the landscape. The articles' content could range from a report about a natural disaster to a report about a building redevelopment. Collate the articles and help the students to design and publish a class newspaper.

Changing planets

Help the students to write a fictional recount, from the perspective of another person in their community (e.g. farmer, fisher, tourist operator), describing their feelings regarding a significant change to the local landscape.

UNIT 27: KNOW YOUR NEIGHBOURS

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), English, Creative Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 4–6

UNIT DESCRIPTION

This unit encourages students to look at the homes, shops, streets and other features of the neighbourhood around their school. Using the children's fiction *My Place* as a starting point, they study specific aspects of a place while locating it within a historical context. Through close exploration of the text and of their local area, they gain the field knowledge and textual understandings to construct a narrative about their place.

WORD BANK

generation, timeline

RESOURCES

Print

Creenaune, T & Rowles, L (1996) *What's Your Purpose?*. Primary English Teaching Association, Sydney.

Jacaranda English (1992) *Debatable Issues*. Jacaranda Press, Brisbane.

Wheatley, N & Rawlins, D (1987) *My Place*. HarperCollins, Melbourne.

Engaging

Introduce students to the concept of environmental change by reading the text *My Place*. During reading, use the graphic outline strategy (Creenaune & Rowles, 1996) to support students' understanding of the text, and the way it (and the information it contains) is organised.

After reading each section of the book, ask students to record the things that they found out. Once students have completed this activity, each will have a timeline of the 'place'. (For a more detailed description of this strategy, see Creenaune & Rowles, 1996.)

Ask students to create a noun poem about one period of time depicted in *My Place*. Each line contains an: adjective, noun, adverb. The poem concludes with a summative word, phrase or short sentence.

Inquiring

Have students add significant events in Australian history to their timeline.

Provide students with a map of the neighbourhood around the school. Allocate subsets of the area to different groups of students. Each group has the task of imagining what their small piece of the neighbourhood looked like over five generations. The fifth generation could be in the future. Help the students to tour the area and speak to people who may remember what it was like. Stress that this information is the background to a fictionalised account.

Brainstorm and record words describing the neighbourhood. Pool these words onto a large chart or create a 'quilt of words'. The words will be used to support students to write a jointly and individually constructed description of the site that they visited.

Ask student groups to choose one house in their area and populate it with three generations of imaginary people. The household could be a large family, small family, friendship group, business or single person. Ask groups to devise a short play based on meetings and conservations with other households held around the time of a significant event.

As a class, jointly construct a written text to explain how to get from one part of the neighbourhood to another 50 years ago.

Acting

Take the class on an excursion to a conservation area. This could be a natural or built environment.

Organise for an expert to talk to students about conservation practices in the natural and built environments.

As homework, ask the students to invite their parents/carers to list people and places that are sources of community support. For example: ambulance, doctor, fire brigade, police service, local council, library, museum, Aboriginal land council, helpline, community centre, safe houses, trusted people/friends.

Host an open day for the local neighbourhood so that community helpers can meet each other and the students.

Communicating

Encourage the students to illustrate and desktop-publish neighbourhood narratives. Alternatively, student groups could devise a 'Choose your own neighbourhood adventure' as linked web pages.

Suggest that students read their stories to younger schoolmates.

Enact one group's play as a theatrical piece, or treat the plays as film scripts and videotape each group of students performing their piece on site, to be viewed later by the entire class.

UNIT 28: HERITAGE TRAIL

LEARNING AREAS

Studies of Society and Environment (NSW: HSIE), English, The Arts (NSW: Creative and Practical Arts)

UNIT LEVEL

Years 5 & 6

UNIT DESCRIPTION

After discussing the many aspects of 'heritage', students consider local district features from the time of colonial occupation, noting similarities to, and differences from, the present. Using local resources and research tools, they identify and investigate sites of significance with a view to planning a heritage walk and supporting site preservation. Students prepare a submission to the local council to protect a special site of significance to them. The submission includes research using written and oral modes of communication.

WORD BANK

Burra Charter, classified, endangered, evidence, heritage, listed, national estate, significant, world heritage area

RESOURCES

Print

Early 20th-century black-and-white photographs of the local area.

Maps: large-scale map of the local district dating from the late 19th or early 20th century; recent large-scale map; base map of local area.

Nicholson, J (1997) *A Home among the Gum Trees.*
Allen & Unwin, Sydney.

Vytrhlik, J (1995) *Kids, Costumes and Culture.*
Powerhouse Publishing, Sydney.

Video

Film Australia (2000) *Federation.* Three-part video, 170 mins. ABC Video.

Websites

www.ahc.gov.au/register/
Australian Heritage Commission. Heritage listings.

www.abc.net.au
ABC online.

http://pandora.nla.gov.au/pan/10492/20021115/index.htm
Web archive of the National Council for the Centenary of Federation site.

www.nationaltrust.org.au
National Trust of Australia. Includes state/territory sections and a list of endangered species.

Engaging

Explain to the students that whilst they don't have a long personal history yet, they do have an important cultural identity. This 'identity' commonly has links to other countries. Ask each student to design a poster called 'My personal heritage' (adapted from Vytrhlik, 1995). Include this information:

- My family name and its place of origin
- Where my family was born
- Where I was born
- We speak this language at home
- Celebrations
- Festive food
- Family photo
- A favourite family story
- My favourite place

Give each student a map of the town or neighbourhood. Ask them to plot where they: shop, worship, meet friends, gather for special family outings, play sport, picnic. Also ask them to locate and circle the oldest building, plaques or memorials. Compare the maps. Note the number of times each place is circled. Discuss why people value different places in the community.

Ask: 'What is meant by heritage?'. It may refer to people's identity, such as the values, stories and customs they share. It may also refer to a cultural or natural object that is valued by people. Construct a table on the board using the headings 'Identity', 'Cultural object' and 'Natural object'. With the class, brainstorm a list of different examples under each heading. For example, under the heading 'Identity', list different cultures or systems of religious belief. Under 'Cultural object', list examples of technology, architecture or art. Beneath 'Natural object', list significant places like Uluru and the Great Barrier Reef. Encourage the students to recount details of their own background, or visits to places of cultural or natural heritage.

Inquiring

Display an early 20th-century black-and-white photograph of your local district, preferably showing an aspect or area familiar to the students. Help the students speculate about changes that have taken place in the area using the photo as primary evidence. Pose the following questions.

- Identify where the photo was taken.
- Look at the clothes people are wearing. Are they different from clothes worn today?
- Have the buildings changed?
- Have the people changed? Are many women and children on the street?
- What sort of transport is being used?
- Could the people in the photos be your relatives? Why not?

Investigate whether any places in the town are listed by the Australian Heritage Commission or local council. Plot these places on the map and see whether any of the places listed were marked as important to the students.

Agree on six places or sites that students wish to investigate further. Include three that are heritage-listed/classified and three of special importance to the students.

Encourage the students to research the relevance and background of each site. The research should consider whether the site is under threat by development or neglect.

Research tips

Take the class on a walk around the local area and visit significant sites. Encourage students to photograph, draw or videotape the sites.

Visit the local library or historical society to discover more about significant local sites.

Invite the local mayor, religious or community leader, or historian to visit and talk about significant sites.

Encourage students to formulate questionnaires, helping them to survey older members of their family and neighbours to build up a picture of their community in the past.

Arrange to visit a local retirement village or residential home where students can interview the residents and record their reminiscences about the history and development of the area.

Acting

Decide whether any of the nominated sites are under threat or should be considered for protection.

The National Trust recommends six steps to save valued sites. Here are three steps that the class could take.

1. Determine if the place has heritage significance. Check for histories or studies of the place; collect written, visual and oral evidence. Does it have importance to the course of our cultural/natural history? Does it involve: rare or endangered aspects? significant technical or aesthetic characteristics? special associations with an important person or group?
2. Find out if the site is heritage-listed. If not, nominate it for relevant registers such the National Trust, Register of the National Estate, State/Territory Heritage Register or local council heritage list or plan.
3. Identify the threat and write to the local council and newspaper.

Communicating

Help groups of students to collate the information they have gathered into a submission to present to the local council. Possible formats for the submission include: a map showing the chosen site, accompanied by a pamphlet or sequenced audio tour giving background information; a narrated video of the site.

Help the students prepare a letter inviting a councillor to the school so they can present their submission. Have the students read their draft letters to the class and vote on the best letter to send. (Signal to the students that their submission would not necessarily protect the site but could alert the council to their concerns.)

Divide the students into pairs and ask them to plan, design, illustrate and provide copy for a newspaper article describing their significant site.

Invite the students to participate in a structured debate: '[Name of important site] should be preserved for future generations'.

UNIT 29: BIODIVERSITY

LEARNING AREAS

Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts), Studies of Society and Environment (NSW: HSIE)

UNIT LEVEL

Years 5 & 6

UNIT DESCRIPTION

Students explore the decline in the diversity of animal species over time, and the environmental issues that have caused this decline. With a focus on animal populations, they interrogate local sources of knowledge to make predictions about the health of nearby waterways. They test their predictions using a variety of research techniques, and communicate their findings or opinions in an appropriate form.

WORD BANK

biodiversity, species

RESOURCES

Print

Gould League (1999) *Food Webs, Biodiversity and Classification.* Kit. Gould League, Melbourne.

Pyers, G (2000) *Endangered Animals of Australia's Deserts.* Echnida Books, Sydney.

Pyers, G (2000) *Endangered Animals of Australia's Forests.* Echnida Books, Sydney.

Pyers, G (2000) *Endangered Animals of Australia's Wetlands and Grasslands.* Echnida Books, Sydney.

Whitty, H (2002) *Land.* 'Eco' series. Macmillan Education, Melbourne.

Whitty, H (2002) *Water.* 'Eco' series. Macmillan Education, Melbourne.

Websites

www.wwf.org.au
WWF Australia. Go to Threatened Species Network for fact sheets and ideas for involvement.

www.biodiversity.environment.gov.au
Environment Australia – Biodiversity Group.

www.ozgreen.org.au
Oz Green. Resources include a low-cost water-testing kit.

www.streamwatch.org.au
Streamwatch.

www.waterwatch.org.au
Waterwatch.

www.asxfrogfocus.com
Frog Focus.

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Engaging

Ask students, in pairs, to imagine their favourite place near a waterway, then to describe this place to their partner – how it looks, smells, feels, sounds.

Have students draw a map of this place based on their partner's description. Ask them to swap maps and comment, then have each student map their own favourite place.

Ask students to record on the map the fish, birds or other animal species they have spotted in this area. Ask them to predict whether the number of animals in this area might have been less/greater in the past. Ask them to justify their predictions.

Invite a local guest specialist speaker to talk to the class about his/her favourite place near the water, recounting experiences in relation to fish, bird and/or animal species and their numbers. Encourage the speaker to bring photos, newspaper cuttings, trophies (e.g. fishing trophies) and skins as sources of information. If you wish to record this talk, seek agreement from the speaker and organise suitable technology.

Brainstorm information gained from the talk. Discuss and organise this information.

Ask students to predict, based on available information, whether fish, animals or birds are increasing or decreasing in your local environment.

Ask student pairs to develop a set of questions for further research. They should list a range of strategies and possible resources that might be useful in attempting to answer these questions. Ask each pair to share their questions, strategies and resources with the class. Ensure that students' questions link into the unit theme and that they focus on examining how changes in environment over time affect animal species.

Inquiring

Choose a number of questions and actions from each pair of students to use as the basis for class work.

Suggest that the students do a web search starting with the key words *biodiversity+Australia*.

Support students to locate and contact appropriate experts, utilising the resources and expertise of local council, environmental education centres, National Parks and Wildlife, Waterwatch and Landcare.

Acting

Organise a field trip to a local area where students can undertake fieldwork including: water sampling, minibeast surveys, water-bug surveys, fish/animal surveys, bird-watching. One or all of the local experts identified earlier could advise you.

Adopt an area to monitor local populations over time and contribute to national biodiversity studies (see website resources for formal avenues of participation).

Communicating

Ask students to provide individual written records of their research. Help them to decide which text form is most appropriate for their purpose and audience. Consider the following approaches.

Information report – appropriate if students have researched a particular species. This text would typically include a general statement indicating the animal's classification within the natural world, and identifying where and when it is found. It would then provide details that might include: physical features and their functions, habitat, behaviour (including reproduction), enemies, and threats from environmental change.

Description and explanation – appropriate if students' research focused on how and why particular environmental management practices have changed over time to protect particular species.

Exposition – appropriate if students' research focused on arguments as to why particular plants and animals are important to the local area, or to outline arguments as to why the environmental interactions investigated have impacted on local species populations and/or why action should be taken to address the issue.

Provide students with an opportunity to augment their written communications by creating a mural – using pictures, photos and/or drawings – that represents visually the outcomes of their research.

UNIT 30: AGENDA 21

LEARNING AREAS	Studies of Society and Environment (NSW: HSIE), Science (NSW: Science and Technology), English, The Arts (NSW: Creative and Practical Arts)
UNIT LEVEL	Years 5 & 6
UNIT DESCRIPTION	Students draw on current environmental data and imaginative exploration to project a vision of their future. They consider the attributes of an ideal town or neighbourhood, and look at local actions aimed at sustaining human communities and environments. Their investigation culminates in a joint action aimed at supporting sustainable development.
WORD BANK	agenda, ideal, indicator, sustainable
RESOURCES	Print

Baker, J (1988) *Where the Forest Meets the Sea*. Walker Books, London.

Dunn, R (1988) *The Gift*. Penguin, Melbourne.

Mattingley, C (1992) *The Battle of the Galah Trees*. Hodder & Stoughton, Sydney.

United Nations Environment Program (1999) *Pachamama: Our Earth – Our Future*. Evans Books, London.

Websites

www.unep.org
United Nations Environment Program.

www.grida.no/geo2000/pacha/contents.htm
Online version of *Pachamama: Our Earth – Our Future*, an environmental report and action plan written by children around the world.

www.panda.org
WWF – the Conservation Organisation
(includes *The Living Planet* report).

www.ea.gov.au/soe
State of the Environment reports.

www.curriculumsupport.nsw.edu.au/enviroed/index.cfm
Environmental education support from the NSW Department of Education and Training.

www.un.org/esa/sustdev/agenda21.htm
The UN's Agenda 21 sustainable development plan.

www.futurescapes.com.au
Gould League – Future Scapes.

Engaging

Conduct a guided meditation session with the students. Ask them to close their eyes and be very quiet so all they can hear is their heartbeat. Tell them that they are now going to step into their future. Quietly guide them through a typical day in 20 years' time, asking questions such as:

Where are you living?

Are there any stairs in your home? Must you catch a lift? Is your house set in a garden? What colour are the walls in the kitchen?

Is there a breeze blowing through your window? What does it smell like? Is it fresh like the sea? Can you smell next door's breakfast cooking? Is that car fumes you can smell?

Take a drink of water from the tap. How does it taste?

How many people are in the house? Are they noisy? Are there any children?

Do you own a dog? Do you walk it at night? What is the street like outside? Is there a park or garden nearby?

Do you own a car? What kind is it? What colour is it?

What do you do during the day? Go to your favourite shop: what can you buy?

After they have opened their eyes, ask the students to draw and caption all the things they saw in their future. Ask them to describe their future to a partner.

Play Future Scapes online (see website resources), registering each student in the class and using their commitments as a result of playing the game to create an Environmental Action Plan.

Collate information about the state of the environment and the future challenges. For example:

- reports from The United Nations Environment Program (a version for young children called *Pachamama: Our Earth – Our Future* was published in 1999)
- the *Living Planet* report and fact sheets from the WWF
- state of the environment reports from Environment Australia.

(See website resources for source details.)

Allow time for students, in groups, to review selected documents or websites. Ask each group to prepare an illustrated information report summarising what they have found out.

Brainstorm suggestions for improving the situation, noting all student ideas on the board.

Inquiring

Divide the class into two research streams:

- Agenda 21 internationally
- Agenda 21 locally.

Each group will uncover the role and purpose of Agenda 21 and consider how they can contribute to the Agenda 21 process. Focus their research on finding outstanding examples of community action and involvement. Set up email groups within the class: each group is to prepare a word-processed research report and email it to the other groups.

Invite a local council representative to tell the class about Agenda 21. It is likely your local council will be involved in this initiative, otherwise the state government department responsible for the environment or the local environmental group will certainly be aware of it. The students should be prepared to suggest ways that they can help the government.

Tell the students that they can contribute to Agenda 21 by advising the local council on the sort of town or neighbourhood they would like to live in. Ask the students to imagine the ideal town. Building on students' suggestions, list 20 adjectives that describe the town. Add them to the word bank.

Brainstorm all the things that make up a town, such as:

Community – neighbours, clubs

Education – schools, universities

Employment

Health services – hospitals, ambulances

Leisure activities – skateboard parks, museums, theatre

Open space – parks, gardens, piazzas

Services – shops, banks.

Ask student pairs to design the ideal town, drawing all the features they would like included. Link each pair with another pair to combine the best features of their designs. Combine each small group with another group until the whole class has a shared idea of their ideal town. Provide the materials for them to build a model. If possible, take a trip to a recycling yard and allow the students to select the materials for their model. Provide magazines so they can cut out images of textures, locations and people to use in their model. Alternatively, the students could paint or desktop-publish a poster of their ideal town.

Acting

Inform the class that one successful Agenda 21 program is Bike Aid – Pedal for Peace, where students raise awareness about sustainable development and raise funds by cycling across the countryside each summer. Suggest to the class that they organise a mini Bike Aid – Pedal for Progress. This could be done in conjunction with other schools in the area, and will require adult assistance. Using a problem-solving approach (Department of Education Tasmania, 2002), lead the students in a small-group discussion to identify how to obtain this assistance:

Identify the problem.

Suggest possible solutions, e.g. write to the parent body; enlist the resources of an active environment group.

Predict possible outcomes if the solutions are adopted.

Choose the most suitable solution and consider how to make it happen.

Implement your idea.

Reflect on whether your solution was effective and make another choice if necessary.

The students should also consider:

- safety issues in conducting the ride
- the environmental issue on which they wish to focus
- whether they want to raise funds, and the purpose of these funds
- the best way to raise funds, e.g. sponsor, pledges, donation.

Communicating

Lead the students in discussion about key aspects of the publishing process, such as the need to check for truth and accuracy, to proofread for consistency and spelling, to obtain permission to reproduce other people's work, and to gain approval or 'sign-off' from someone in authority before printing or posting documents.

Support the students to publish their information reports on the state of the world's environment as a series in the school newsletter, or on the school's website.

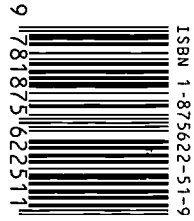
As a class, write to the local council requesting that it display the class's 'ideal town' model at the council chambers or local library during the school holidays to raise awareness for Agenda 21. If students have painted 'ideal town' posters, contribute the posters to the United Nations International Children's Environmental Painting Competition.

From coast to coast, Australia's diverse environments reflect the impact of generations of human activity and decision-making.

This collection of teaching units, designed for primary classrooms, aims to shed light on the challenges that face a new generation of Australians as they seek to sustain living communities and environments.

Focusing on the local places and spaces that students know and care about, the units connect with big national and international issues such as land care, water use, salinity, biodiversity, cultural heritage, consumption and waste.

Rich with possibilities for in-depth investigation, the units model processes of active research, evaluation, response and communication that are an essential part of informed resource management.



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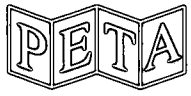

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